



A HISTORY
OF
ASIATIC CHOLERA.

BY
C. MACNAMARA, F.C.U.
SURGEON TO THE WESTMINSTER HOSPITAL.

London:
MACMILLAN AND CO.
1876.

[The Right of Translation and Reproduction is reserved.]

P R E F A C E.

By far the majority of books hitherto written on the subject of Asiatic Cholera contain such numerous references to matters with which medical men are alone familiar, that it is difficult for non-professional readers to study them to advantage ; and one of the main objects I have had in view in compiling the following account of the six great epidemic outbursts of this disease (which have since 1817 spread over the world) has been to overcome this difficulty.

I feel sure that it must be my own fault if the details given in the following work are not sufficiently attractive to interest the public ; for the subject I have taken in hand is nothing less than an account of a controllable disease which has within the last fifty years burst forth from British India ; and destroyed on each occasion millions of human beings, many of them in the prime of life ; and all cut off by this malady have endured frightful agony during the few hours they have lingered in its grasp. I am well aware that the public will meet with details in this volume which are seldom brought to their notice ; subjects of this kind have as a rule been left for medical

men to elucidate, but the result has been unsatisfactory, as the conflicting theories and opinions at present existing regarding these matters sufficiently demonstrate.

The plain and simple question therefore resolves itself into this—Have educated Englishmen any desire to gain information on matters which so vitally affect the well-being of vast numbers of their fellow-creatures? If not, there is an end of the matter, and my researches can only be useful to medical students. But there is no further excuse for avoiding the responsibility which rests on each one of us to endeavour to acquire knowledge on a subject which is within the sphere of all thinking and reasoning men, and thereby to influence for good those with whom we are brought in contact.

I am quite convinced, however, of the fact that it is useless attempting to comprehend the nature of this dire malady without first becoming thoroughly acquainted with the lessons which its history is capable of teaching us. There is no great difficulty in tracing out the progress of the earlier epidemics of cholera over Europe and America; but of late years, in consequence of the more rapid communication established between India, Persia, and Russia, cholera has shown a tendency to localize itself beyond the confines of Hindostan, and so it has become impossible to follow each outburst of the disease from Western Europe back to its starting-point in Bengal. But this present difficulty makes it all the more important for us to study the earlier history of cholera, and by means of the knowledge thus acquired

to examine its characteristic features where it has appeared under more complicated circumstances. The scope of my labours, however, are so well described by Colonel G. Chesney in the following review of a former work of mine, (now out of print,) on the subject, that I cannot do better than republish his remarks, in order that the reader may gain an idea of the contents of this volume before commencing its perusal.

If there be one subject more than another which is likely to receive attention from residents in India, it is the fell disease which appears to become less and less under control as time goes on; whose ravages grow more and more formidable every year, and obtain a more easy victory over the feeble efforts of so-called medical science to restrain it. Yet, considering the supreme importance of the subject, it is surprising how little attention (properly so called) it has received. There have been reports in profusion, describing the symptoms of the patient, the progress of the pestilence through the land, and the generally utter futility of the treatment applied; but anything like a systematic study of the disease and its course has seldom been attempted, while it need hardly be said that there has been an abundant outpouring of dogmatic assertion, unsupported by anything like evidence. . . .

Mr. Macnamara claims, indeed, not a remedy for the disease, but the manner of its propagation, and if his conclusions be correct, it is quite impossible to overrate their value. . . .

Cholera is not contagious, but is only communicable by swallowing a portion of the poisonous discharge from a person labouring under the disease. This poison when dry is innocuous, but will retain its properties for an indefinite time, until, when dissolved in water, it becomes at once violently active for a limited time until decomposition is effected. How then does Mr. Macnamara substantiate his theory? In the first place he shows, we think very satisfactorily, by a careful collection of facts, that there is no sufficient basis for the supposition that cholera is communicable through the air. In every case where cholera has broken out in a foreign country, it has first appeared on the seaboard, and always after the arrival of a ship which has had cases of cholera on

board. Australia, where cholera has never appeared, has little communication with the seat of cholera, there being only about 15 or 16 ships a year sailing from Calcutta to that country, while the voyage is so long that the ships have time to be purged of the disease. So far then the case seems, when stated in the complete way, and supported by the long array of evidence given by Mr. Macnamara, to be satisfactorily established. But it still has to be proved that the poison is actually imbibed, *only* by being swallowed in water and carried into the intestines. In evidence of this Mr. Macnamara appears to rely mainly on two cases, which certainly strongly corroborate the positive part of his theory; that is, they show very clearly that cholera can be communicated in this way, though whether it cannot also be communicated in other ways appears, we think, hardly to be made out. (See pp. 210 and 268.)

The evidence in these cases, as stated by Mr. Macnamara, was very complete and conclusive, and appear to establish his hypothesis of the action of cholera poison. But* that the poison acts only in this way appears to us not to be so satisfactorily proved. The theory assumes that, in order to be infected by the cholera poison it must be taken into the intestinal canal, and practically this can only occur from drinking water which has become contaminated by the evacuations of a person suffering from the disease. That drinking water should thus become contaminated in India is easily conceived, because the same water usually serves for ablutions and drinking purposes, and in this way a body of travellers may easily carry the disease from one camping ground to another, spreading cholera over the country. The hypothesis, therefore, satisfactorily accounts for the transmission^r of cholera through India, as observed in the case of troops marching, and the dispersion of pilgrims collected at Hurdwar and other places where religious fairs are held. But the cause of the spread of cholera in Europe is more obscurely indicated. What usually happens is this: A ship arrives from a cholera-stricken country, in which cases of cholera have occurred during the voyage, and shortly afterwards it breaks out in the quarter of the town frequented by the sailors, generally in the very house which they are known to have visited. Here the evidence appears complete, that the disease is communicated directly in *some* way from man to man, and that the poison is not conveyed merely through the agency of the air, as has often been supposed. But in order that Mr. Macnamara's theory be

the correct one, it is required that, in every case of cholera breaking out in a seaport town, there should be a well of drinking water in convenient proximity to the cesspool which receives the washings of the cholera poison brought by the sailors, in the way of foul clothes or otherwise. The well known filthy condition of the back slums of almost all seaports renders it highly probable that such a mode of disseminating the poison exists in every case, but the point cannot be considered to be actually proved. We should add, however, as strongly corroborative of this theory, that in a remarkable number of instances the first case of cholera on these occasions has been that of the woman, or one of her family, who washed the clothes brought from the ships in which cholera had occurred during the voyage. Now, the steam from the water would no doubt contain the poison with which the latter was impregnated, and a person inhaling this vapour for a considerable time would in effect swallow the poison, if contained in the water, just as effectually as by drinking it.

On the whole, the conclusion appears to be justified that Mr. Macnamara has established his theory so far as what is termed, in logical parlance, the method of agreement; that is to say, it is, we think, clearly proved that a certain cause—organic matter derived from cholera of a certain kind and in a certain state—will always produce a certain effect, namely, reproduction of cholera in the person imbibing it. We have indeed cited only two cases; but we infer from what Mr. Macnamara says, that he has established this fact beyond doubt or question in other cases. But the other kind of proof, known as the method of differences, has yet it seems to us to be established. A certain cause will produce a certain effect, but will not this effect be produced when this cause is absent—or, in other words, is this the *only* cause which will produce this effect? Cholera can and will be produced by drinking water polluted by matter from the persons of cholera patients—of that there can be no sort of doubt—but must a person imbibe this matter in order to be attacked by cholera? To prove this will obviously require very delicate investigation, but until it is proved the theory cannot be held to be completely established. Meanwhile, there is this strong presumption in favour of its truth, that all the facts as observed fit the theory. . . .

Cholera, says Mr. Macnamara, is communicated by contaminated water. The disease is indigenous in Bengal; to all other parts of the world it is spread by pollution of water, and

if not renewed by fresh contact with Bengal, the disease in those parts gradually dies out and disappears. Why it should require renewal, and should not go on spreading indefinitely just as it began, cannot be explained, any more than we can explain why the European race cannot be perpetuated in the tropics ; or why—to use an apt illustration employed by our author—indigo in Tirhoot has always to be raised from imported seed. Still the fact is so ; and if the theory of propagation be true, the remedy is plain. Mr. Macnamara does not profess to throw any light on the proper treatment of the disease, but he affirms that the disease itself may be stamped out simply by taking sufficient precaution against contamination of the drinking water. This theory may unhappily prove to be fallacious ; but, at any rate, it will be perfectly inexcusable not to give it a most full and careful trial, more especially since this involves merely the employment of precautions which in themselves are wholly unobjectionable. Certain it is, that epidemic cholera has disappeared from Fort William since that place has been supplied with filtered water. (See p. 431.) What has now to be done is, to set about trying at once whether this awful scourge cannot by similar precautions be kept away from our other military stations during the coming hot season, when a return of it is certainly to be looked for. In this view Artesian wells would be worth a king's ransom ; but at any rate no trouble should be spared to protect existing wells of drinking water from any possible pollution—to arrange for bringing the water into the barracks in a cleanly form, abolishing especially the filthy bheestee's mussuck, and passing it through proper filters before issuing it to be drunk.—*The Pioneer*, March 9, 1870.

I cannot conclude this preface, without returning my best thanks to the Rev. J. Long, for the trouble he has taken in translating Russian works and references on cholera for me.

CONTENTS.

CHAPTER I.

	PAGE
Definition of Asiatic Cholera—History of Communication " between India and Europe,	I

CHAPTER II.

History of Asiatic Cholera prior to the Year 1817,	28
--	----

CHAPTER III.

The Epidemic Cholera of 1817-23,	46
--	----

CHAPTER IV.

The Epidemic of Indo-European Cholera of 1826-34,	77
---	----

CHAPTER V.

Epidemic Cholera in India, from the Year 1830 to 1845,	115
--	-----

CHAPTER VI.

Asiatic Cholera of 1841-46, and its progress into Europe in 1847-49,	141
---	-----

CHAPTER VII.

The Indo-European Epidemic Cholera of 1848-53,	183
--	-----

CHAPTER VIII.

	PAGE
The Epidemic Cholera in India of 1855-56, and its Progress into Persia, Arabia, and Africa,	226

CHAPTER IX.

Cholera in India from 1858, & Punjab Epidemic of 1861,	257
--	-----

CHAPTER X.

Asiatic Cholera in Bengal during 1863-64, and its Passage through Bombay to Africa, Arabia, and over Europe to America,	283
---	-----

CHAPTER XI.

Cholera in India during the Year 1864-65, and its Appearance in the North of Persia and Europe in 1868-70,	342
---	-----

CHAPTER XII.

Geographical Distribution of Cholera—Effect of Meteorological Influences on the Disease,	396
APPENDIX,	450
Characteristic Features of Asiatic Cholera,	450
Rules for Precautions against the Infection of Cholera,	461

ERRATUM.

Page 233, line 20, *for* "Kolka" *read* "Kassowlie."

ASIATIC CHOLERA.

CHAPTER I.

DEFINITION OF ASIATIC CHOLERA—HISTORY OF COMMUNICATION BETWEEN INDIA AND EUROPE.

AT the commencement of a work of this kind, it is necessary to define the characteristic features of the disease we are about to study, the more so, as it unfortunately happens that medical authorities have described several forms of cholera. I would therefore have it clearly understood that by "*Cholera Asiatica*" I mean

a disease which is capable of being communicated to persons otherwise in sound health, through the dejecta of patients suffering from this malady; these fomes are most commonly disseminated through a community, and taken into the system by means of drinking water—the dejecta finding their way by percolation through the soil or ill constituted drains into wells, or, it may be, being directly emptied into rivers from which drinking water is supplied. The disease can likewise be propagated by various articles of diet, such as milk, or in fact by anything swallowed which has been contaminated by the organic matter passed by cholera patients. In badly ventilated rooms the atmosphere may be so fully charged with the exhalations from the choleraic fomes,

that people employed in nursing the sick may become poisoned. Fluids, and probably solids, exposed to air of this description absorb the organic matter, and may thus become the medium for transmitting the disease. In the same way persons engaged in carrying the bodies of those who have died from cholera for burial, or in washing their soiled linen, may contract the malady.

Cases of Asiatic cholera are constantly met with at all seasons of the year in certain localities in India—it is in fact endemic in these places; but beyond its endemic area the disease never appears, unless imported either by those suffering from it, or by articles of clothing or linen, or such like media which have been contaminated by choleraic dejecta. In a dried condition, the organic poison contained in the cholera fomes may retain its dangerous properties for a very considerable time, and thus the disease may be carried from one country to another.

Cholera occasionally assumes a widely spreading character, becoming epidemic; and it may then be proved to have been disseminated from its endemic area by the means above indicated throughout the world. It seldom continues under these circumstances for more than three consecutive seasons in any one place, and generally disappears in each succeeding winter, bursting out again on the approach of the hottest months of the year.

The symptoms of Asiatic cholera are as follows:—The person affected by the disease first complains of a feeling of oppression or faintness referable to the pit of the stomach, followed by frequent watery stools, constant vomiting, suppression of urine, and profuse perspiration. The patient's skin is inelastic, and that of his hands and feet shrivelled and dusky, his eyes are sunk deeply in the orbits, and his features are pinched, severe cramps affect the muscles of his limbs, there is difficulty of breathing, intense thirst, rapid and small pulse, and suppressed voice. The temperature of the body falls, and the patient often passes rapidly into a state of collapse.

These symptoms appear in persons otherwise in sound health and of regular habits, they come on without any premonitory warning, and the attack may run its course, and terminate fatally within an interval of from six to twelve hours; but more commonly it ends in some thirty hours from its commencement, either in death, or

the collapse gradually passes off; but even then the patient runs great risk from various complications. Not more than 50 per cent of persons attacked by Asiatic cholera recover; and, unless in its very early stages medical treatment has no influence over the disease.

The history of Asiatic cholera is so closely connected with the commercial relations which have existed from the earliest ages between Europe and Hindostan, that it is necessary we should have clear ideas regarding the principal routes along which merchandise has been carried from India into the Western world, before we can possibly comprehend the circumstances of the various outbreaks of cholera which have from time to time extended over the greater part of Asia, Europe, and America.

The earlier Hindoo writers have left us in the dark as to the knowledge they possessed of foreign countries; but the truth is, the intercourse between the natives of India and foreigners must necessarily have been extremely limited, for not only is the Hindoo prevented by his religious prejudices from undertaking a sea voyage, but he is also barred from all social intercourse with every one beyond the pale of his own caste. The inhabitants of Hindostan have consequently for ages past been bound to their soil, and they have also been singularly free from foreign invasion until the country was opened out by maritime adventurers. There is, in fact, no portion of the globe more difficult to approach by land than the peninsula of India. Shut in by the Himalayas, it is like a great world apart. And it is in consequence of this isolation of the people of India from

the rest of the world, that we find communities there at the present time governed by Aryan laws and usages, which in all probability were common to a very large portion of the existing human family, but which have been obliterated to a great extent among other nations, in consequence of the alterations in the conditions by which they have become surrounded. But in India time seems to have stayed his destroying hand, enabling the people of the nineteenth century to form some ideas of the state of society, which probably flourished when all the civilized tribes of the earth spoke a common language. It is only possible, however, for a few Englishmen to draw aside the veil which screens the family life of the descendants of the old Aryan stock, and thus obtain a glimpse of the interesting picture which is frequently presented by the conjoined Hindoo family. A phase of society engendered by the growth of ages, greatly modified by climatic and other influences, but which is now shaken to its foundations by the introduction of our literature, and I am sorry to say many of our vices, among the inhabitants of the country; through these agencies the religion of the Hindoos is destroyed, and with it the ancient conjoined family ties are broken through; and all we offer in place of these sacred obligations is a heartless system of moral philosophy and ethics. But let those who rely on the efficacy of an education of this description in forming the character of the rising generation, go and study its outcome among the middle classes of Bengal. It has been my lot for a considerable number of years to mix as a professional man

among the families of the better classes of natives, and I have always been treated by them in the same confidential manner as medical men are trusted by their patients in this country, so that I have come to know the mothers and wives of the native inhabitants of Calcutta ; and it is impossible for me to describe the state of feeling which exists among them, and among the better informed men also, as to the perversion and moral corruption of a large proportion of the rising generation (male) of native society, and which they attribute to the influences I have referred to. I do not exaggerate when I say that a number of the better classes of natives in India, believing in, and fully convinced of the advantages in the way of order and security of the person they enjoy under our rule, are hardly prepared to admit that these privileges are a sufficient compensation for much which they have lost from the rapid diffusion of European ideas and laws among them. The traditions and feelings of the Hindoo system is still, however, very strong in the Zananna, and the problem of the day, so far as the real prosperity of India is concerned, refers to social questions of this kind, and they must be at once firmly and honestly faced, if we are to retain our position in India.

We must, however, turn to the subject with which we are more directly concerned, and briefly consider the history of the trade routes between Hindostan and Europe, along the Arabian Gulf and through Egypt ; secondly, the route down the Persian Gulf and the Rivers Euphrates and Tigris to the sea-port towns of Asia

Minor; and, lastly, the passage from India through Afghanistan, and up the Oxus; as well as that directly from Candahar, Herat, and Persia, either to the Caspian or the Black Sea.

It is unnecessary for the purpose I have in view, to consider the circumstances of the trade route through the Red Sea from India, as carried on by the Egyptians and Grecians, because we know that so long as these nations held command of this high road to the East that commercial operations were confined to coasting vessels, which sailed along the shores of India, Arabia, and passed to the north of the Gulf of Suez, entering the port of Elath after a tedious voyage, which often extended over a period of more than a year! From Elath the merchandise was carried across the desert to Rhenoclara, and from thence by sea to Tyre, or some of the other ports on the coast of Asia Minor, and so to Europe. Subsequent to the conquest of Egypt by Alexander, in consequence of the difficulty experienced in navigating the northern part of the Red Sea, the course of trade was diverted from Elath to Berence, a port on the coast of Africa situated about 420 miles to the south of Suez, and from this place goods were carried across the desert to the Nile, and so to Alexandria. It was not, however, until eighty years after Egypt had been annexed to the Roman Empire, that any material improvement took place in the passage of vessels from India to Berence. About this time Hippalus first relinquished the slow and circuitous course of navigating along the coast, and setting sail from the mouth of the

Arabian Gulf, was carried by the western monsoon to the coast of Malabar. Pliny, writing A.D. 70, says, that vessels leaving the coast of Hindostan in December sailed with the north-east wind to the mouth of the Arabian Gulf, which they might reach in forty days. On entering the gulf they were met by a south-west wind, and so reached Berence in another month. The merchandise was landed at this port, and carried across the desert to Coptos, a distance of 280 miles. On account of the great heat, the caravans could only travel after sunset, and the journey occupied twelve nights. At Coptos the goods were put into boats and carried up the Nile to Alexandria, a distance of 300 miles, and thus, adds Pliny, the voyage could be completed to and from India in a year's time.* Merchandise thus transported to Europe consisted of spices, aromatics, precious stones, pearls, and silk; but it is evident this trade must have been undertaken in vessels manned by Egyptian or Roman sailors; for if the natives of India had been in the habit of visiting Egypt, or if Europeans had been accustomed to pass into the interior of India, the circumstances of its people and the geography of the country would have been familiar to Grecian and Roman historians. That such was not the case is clear from the limited knowledge which they possessed of India, as displayed, for instance, in the works of Ptolemy, who resided in Alexandria at the time when the trade between that city and the east was most flourishing; and it was not long after the publication of Ptolemy's works, that Egypt

* Pliny, *Natural History*, lib. vi, cap. 23.

was conquered by the Mohamedans, A.D. 640; and from that period the road to India through Egypt was barred to all Christians, so that the direct intercourse between Europeans and the natives of Hindostan was effectually stopped; in fact, the observations of Cosmas' Indico-pleustes, in the sixth century, was the last account which the western world received of India from any person who had visited the country, until the middle of the thirteenth century.

But the circumstances of the navigation of the Red Sea is referred to by an Arabian author, Abu-Zeid Hasan. In the year A.D. 898, he remarks, that vessels, manned by natives of India or of the Persian Gulf, dare not proceed farther north than Jeddah, at which port the cargoes of these ships were transferred to vessels navigated by men acquainted with the Red Sea, which

“is full of rocks up to the water's edge, and because also upon the whole coast, not a river is to be found or scarcely any inhabited places, and in fine because ships are every night obliged to put into some place of safety for fear of striking upon rocks. They sail in the daytime only, and all night ride at anchor. This sea is, moreover, subject to very thick fogs, and to violent gales of wind, and so has nothing to recommend it either within or without.”

An opinion in which every one will heartily concur who has made a voyage through this terribly hot, dangerous, and inhospitable region. So complete was the obstruction placed by the Mohamedans to the course of trade passing through Egypt, that, as we shall presently explain goods from India were actually carried at this time through Cabul, Bokhara, and

the Caspian Sea, into Russia; and by the Rivers Volga and Don down into the Black Sea and to Constantinople.

But the time was approaching when a change was to be effected in the commercial relations between the eastern and western world, for, in A.D. 1498, Vasco de Gama returned to Lisbon from his first successful voyage to the coast of Malabar; and from that period, although the ancient channel of intercourse with India by the Red Sea remained open to the Arabians, it was impossible for them to compete with the Portuguese, and subsequently with the English, in the carrying trade between India and Europe; for not only was it much cheaper to bring merchandise from Hindostan by sailing vessels round the Cape of Good Hope, but the goods thus carried were freed from the vexatious customs which were imposed on them every time they were transhipped, either through Persia or Egypt, to say nothing of the dangers they ran from pirates on the coast of India, and the perils of the navigation of the Red Sea and Persian Gulf. It is needless for me to enter into the particulars of the trade route between Europe and India by the Cape. As the construction and navigation of sailing vessels improved, the voyage from India was reduced from an average of six to four months, and this was the most rapid, and, in fact, almost the only means of communication between India and Europe from the time of the discovery of the Cape of Good Hope until the re-opening of the route through Egypt. It is evident that early in the eighteenth century

Englishmen, unconnected with the East Indian Companies' service had begun to turn their thoughts to the possibility of the overland route to India through Egypt. Captain Hamilton, while at Mocha in the year 1714, wrote to the English Consul at Cairo, to inquire if it were practicable to cultivate the trade from Bombay *via* Suez. In reply Mr. Farrington dissuaded Captain Hamilton from this attempt, "for it was impossible to be a gainer by means of any such commerce";* but, in spite of this and similar warnings, Carsten Niebuhr, who visited Bombay some sixty years after Captain Hamilton, informs us, that no less than five English vessels from India entered the harbour of Suez during one year; and Niebuhr adds, that the East India Company found this passage so short and convenient, that they sent their couriers by the way of Suez to England, and received answers to their despatches within the time which was formerly occupied in the conveyance of packets to London. Under very favourable circumstances of wind and weather a sailing vessel could reach Suez in six weeks or two month's time from the date of leaving Bombay; but the East Indian Company discouraged the prosecution of trade in this direction, because by means of it the price of Indian goods was so much reduced in the Levant, that the company no longer found sales for their stuffs in the Mediterranean, which they had been accustomed to send there from London. At this time the govern-

* *A New Account of the East Indies*, p. 34. By Captain Alexander Hamilton. London, 1744.

ment hardly contemplated the practicability of opening out the route to Europe by the Red Sea, for Major Rennell, the Surveyor-General of Bengal, writing on this subject, as late as the year 1788, remarks, that "the discovery of the passage round the south of Africa, turned the bulk of the Indian trade into an entirely new channel, *from which it is not likely ever to be deviated.*" Major Rennell was, of course, ignorant of the vast changes which the employment of steam in propelling vessels was soon to effect in the navigation of the Indian Seas.

The first steamer that passed up the Arabian Gulf from Bombay was the "Hugh Lindsay"; she left India in March 1830, and after a passage of 32 days reached Suez. In 1834 a committee of the House of Commons reported that it was practicable to carry on steam communication between Suez and Bombay during the north-east monsoon; but they were doubtful as to its practicability at other seasons of the year. In 1837 another committee reported to the House of Commons, they had learnt with satisfaction that arrangements had been entered into between Her Majesty's Government and the East Indian Company, for the establishment of a monthly communication by steam from Suez to Bombay. And Mr. Waghorn left London in June of the same year to carry out the details of this scheme, which was to consist of three steamers to run to and fro between Suez and Mocha; and from that port six other vessels of 800 tons burden were to convey passengers and mails to Bombay, Madras, and Calcutta.

From this small beginning, in the course of thirty years, the fleet of the Peninsular and Oriental Company's steamers has sprung into existence, with their weekly steamers from Bombay and Calcutta to Suez. And in 1869 the French completed the work of the Suez Canal, through which a vast and increasing traffic flows. The whole trade of India with the ports of the Mediterranean, which amounted in 1869-70 to only £12,000, had risen by a series of rapid leaps to nearly £413,000 in 1873-74; and we may be sure that we see at present only the commencement of a momentous change.

We must now pass on to consider some of the circumstances influencing the trade from India to Europe through the Persian Gulf, and the Rivers Euphrates or Tigris. As far back as the time of Solomon there are indications of traffic from Hindostan in this direction and it was to foster this trade he built, or at any rate greatly increased the town of Palmyra, which was situated some eighty-five miles from the banks of the Euphrates, and about one hundred and sixty from the nearest seaport town on the Mediterranean. Palmyra was the only well watered spot in this part of the desert. But whatever might have been the nature of the trade carried on in this direction, we find that in Alexander's time the Persian monarchs had created enormous dams across the mouths of the Euphrates and Tigris, for the express purpose of obstructing the passage of boats to and from the interior of the country into the Persian Gulf. Alexander removed these dams, and comprehending the advantage to be derived from trade with India in

this direction, threw his marvellous energy into this undertaking. Death, however, cut short his schemes, and his successors had more than sufficient to do in maintaining their power without troubling themselves with the external relations of the country. Nevertheless, subsequent to the time of the restoration of the ancient line of Persian monarchs, the trade between the Persian Gulf and India increased considerably. Mohamed perceived the importance of drawing the commerce from the east into Persia; but from the earliest times up to the present day there has existed an insuperable difficulty to the transit of merchandise along the Euphrates and Tigris to Europe, which consisted in the lawless marauding tribes inhabiting, not only the desert between the rivers of Persia and the shores of the Mediterranean, but they also hold command of a very considerable portion of the banks of these rivers. Besides this, Persia has been subject to constant invasion and to intestine wars, so that had the routes from India to Europe through Persia been unexceptionable in other respects, the condition of her inhabitants would have precluded this from ever being the highway for merchandise from the East. But, in truth, if the country had been settled the means of communication along the route we are now considering were by no means favourable, for the Euphrates was hardly navigable, even by boats of very light draught, beyond the town of Anna; and from this to Aleppo, the caravan journey over the desert was fifteen or sixteen days, and from Aleppo to Antioch two days more. Cara-

vans passed from Damascus to Hit on the Euphrates in nineteen days; but the river was really only navigable for boats drawing more than $4\frac{1}{2}$ feet of water as far up as El-oos, which was 900 miles from the sea, and the whole of this distance boats had to be towed up against the rapid stream, and if succeeding in navigating this portion of their journey without being plundered, they were subjected to constant heavy customs dues, and at the termination of the river's passage had a long and dangerous caravan route before them. Nor were the difficulties to be surmounted in the passage of goods along the Tigris to Europe less than those of the Euphrates. Until the time of the Portuguese monopoly of the trade of India, we may form some idea of the nature of the carrying trade between Hindostan and the mouth of the Persian gulf, from the description of vessels employed in this traffic. Marco Polo visited Hormos on the Persian Gulf in 1273, which he describes as a city of immense trade, and to which the

“inhabitants of India came with ships loaded with spicery, and precious stones, pearls, cloth of silk and gold, elephant's teeth, and many other wares;” and he adds, “their ships are wretched affairs, and many of them get lost, for they have no iron fastenings, and are only stitched together with twine made from the husk of the Indian nut. They beat this husk until it becomes like horse hair, and from it they spin twine, and with this they stitch the planks of ships together! It keeps well and is not corroded by the sea water, but it will not stand well in a storm. The ships are not pitched, but rubbed with fish oil. They have one mast, one sail, and one rudder, and have no deck, but only a cover spread over the cargo when loaded. This cover consists of hides, and on the top of the hides they put horses, which they take back to India for sale. They have

no iron to make nails of, and for this reason they use only wooden trenails in their ship building, and they stitch the planks with twine as I have told you. Hence it is a perilous business to go a voyage in one of these ships, and many of them are lost, for in that sea of India the storms are often terrible." *

But passing over several centuries, if we come down to the year 1787, we may form some notion of the circumstances of the communication between Bombay and Persia from accounts left us by Englishmen travelling along that route to Europe. Dr. Howell, for instance, arrived at Bombay on the 26th November 1787, on his way to England *via* the Persian Gulf, and he informs us that, as a vessel had just started from Bombay for Bassorah, no opportunity for departing occurred until the 13th of January, on which day he left Bombay, and reached Muscat on the 27th of January, and Bassorah on the 23rd of February; he arrived at Bagdad on the 15th of March, and at Constantinople on the 13th of April; on the 27th July he reached Trieste, but was detained there in quarantine for a month, and so did not complete his journey from India to London under twelve months. Lieutenant Franklin started from Calcutta for Persia on the 27th February 1786, by sea, but did not reach Bombay until the 13th of May; he was detained there for no less than seven months, no vessels daring to attempt the passage through the Persian Gulf during the S.W. monsoon; but on the 13th. December he sailed from Bombay, and reached Abu-sheher on the 20th of February. We might quote numerous other instances

* *Travels of Marco Polo*, vol. I, p. 102. By Col. Yule.

of this kind, from which it is evident that from March until November, the cholera months in India, ships rarely, if ever, sailed from the coast of India for the Persian Gulf; and that at favourable seasons of the year the passage of ships manned by English sailors, took from six weeks to two months in sailing from Bombay to the north of the Persian Gulf. Native boats, such as those described by Marco Polo, still pass in considerable numbers along the coast of India to Persia, completing the passage in three or four months.

Steam vessels have been employed in the Persian Gulf since 1853, but only at uncertain intervals; there was no regular communication between Bombay and Bushire, by means of steamer until September 1862, when the British Indian Steam Navigation Company started a line of vessels between India and Persia. At first these vessels ran only once every six weeks, from Bombay to Bassorah. No longer depending on monsoons the passage was made throughout the year, and the trade between India and Persia was found to increase so rapidly, that in 1866-67, instead of every six weeks, the B. I. S. N. Co.'s vessels left Bombay for the north of the Persian Gulf every fortnight; and from 1873 these splendid vessels have run regularly every week from Bombay to Bassorah, and from thence a small river steamer passes backwards and forwards to Bagdad, along the Tigris.

We have still to consider the circumstances of another trade route from India, or rather from the east of Asia into Europe. It is evident that from the earliest times

caravans from the north of China passed along the south of the great desert of Gobi to Tai-tung, and crossing the Yellow River passed through Kansu and Su-chow, and from thence they crossed the desert to Lake Lob, and so to Kotan and Yarkund. There is another route into Kashgar from China to the north of the desert, and which we learn from the *Times* of the 20th October 1875, was lately travelled over by a Russian serjeant, from the town of Lantchufu on the upper part of the Yellow River to the Saizan frontier; he managed to get over the whole distance (about 2,000 miles) in fifty days, passing through Khamil, Barkul, and Guchen; he fell in with some of Yarkob Beg's troops, who occupied the doubtful territory at present held by the soldiers of the Khan of Kashgar. It was by the road to the south of the desert that M. Huc passed in 1842 as far as the town of Chagan-Kooran; and near the ford over the Yellow River he met a caravan consisting of some ten thousand camels, travelling from the west with merchandise for sale in Pekin. It seems very probable that this caravan had passed from Yarkund by Lake Lob, and in fact along the road followed by Marco Polo in the thirteenth century. Haft-Tklim says it was possible to complete the journey in 100 days from Kotan to Pekin.*

From the south of China another imperial road passed along the course of the Blue River as far as the city of Schoong-King-fou, from which place it ran directly west-

* *Travels in Tartary, Thibet, and China*, by M. Huc, vol. I, p. 132.

ward to the town of Ta-siuc-shau, on the borders of China, to be continued on through Bathang and Chambo to the city of Lassa; this was the route followed by the Chinese troops operating against Nepaul in 1793. M. Huc and his companion travelled the whole distance from Lassa to Canton over this road in palanquins, there being post-houses along the road with relays of bearers at each station. It took them, however, six months to complete the journey; but the imperial couriers manage to transmit letters over the same road at the rate of 100 miles *per diem*. From Lassa westward we know of two routes: the most northern passes by the great Tengri-noor lake, through the various gold fields to Thok-Jalung, and from thence, either south-west to Gartok, or north to Rudok and Leh. There is another well known high-road running along the valley of the Brahmaputra, and past the Tadum monastery to Tirthapuri, Gartok, and so to Leh and Cashmere. We find that in 1841 a Chinese force marched in this direction, and expelled the Sikhs from Gartok, extending the borders of the empire as far as Ladak. From Leh, and also from Rudok, roads pass northwards to Khotan and Yarkund. It is very probable, however, that from Rudok a road passed more to the north-west, meeting the ancient highway from Yarkund over the Pamir-Khurd to Faizabad, and so to Balkh; this was the road Marco Polo travelled over, and by which before his time for some 2,000 years merchandise to and from the eastern and western worlds had been conveyed. Balkh was in ancient times a meeting place for a vast commercial

circle ; not only did the trade from China find its way as above noticed to this city, but from the River Indus goods were carried through Cabul to Balkh and up the Oxus, which then emptied itself into the Caspian. Across this sea the merchandise was carried, down the River Volga to within a few miles of the Don, up which it was floated to the Black Sea, and so to Constantinople. During the long period throughout which the Mohamedans excluded European trade from passing through Egypt to India, merchandise was actually conveyed from Hindostan along the above described circuitous route to Constantinople. Another road from Balkh passed northwards to Bokhara and Khiva, and from thence to Novrograd, or along the course of the River Aral to Orenberg. And, lastly, a road from Balkh led to the east and over the Terek Pass to Kashgar.

There was a route for merchandise from India through the Bolan Pass and Candahar to Herat, Nishapur, Astrabad, or to Teheran and Hamadan and thence to Mosul and into Phoenicia ; but another branch road ran to the north through Tabriz, and so to Trebizond on the Black Sea. But the course of trade from India* in this direction was not only hindered because of the expense of carrying goods such a great distance overland, but it was likewise retarded by the incessant wars and turbulent character of the people inhabiting the whole of the country through which the route lay. And subsequent to the introduction of Mohamedanism into Persia, there was a further and more effectual barrier to intercourse between India and Europe. The conquest of

Hindustan by the Mohamedans commenced with Sultan Mohamood's expeditions; but their power hardly extended beyond Lahore until the end of the reign of Shahab in 1206, when the Mogul sovereigns established their head-quarters at Delhi; and even then the communication through Persia from India to the west was again paralyzed by the conquests of Ghenghis Khan, and the occupation of the country by his Tatar followers and their successors until the close of the fifteenth century, before which period the passage from India round the Cape of Good Hope had established a means of communication with the west, which rendered it unnecessary to send merchandise by any but the sea route to Europe.

At first sight it may not appear very clear what the bearing of these observations upon the trade routes between India and Europe can have upon the history of Asiatic cholera; but as we proceed to examine this subject more in detail, we shall be confronted by the question as to why this disease never broke out in an epidemic form in Europe prior to the year 1832? Our reply is—Supposing Asiatic cholera not to have been known in Europe until the time above mentioned, and even admitting that the disease existed in India before that date, and is communicable by means of the excretions of people affected with it to healthy persons, nevertheless, from a consideration of the details I have given, and to the commercial relations between India and the west, the alleged fact is easily explicable, because the means of direct intercourse between the

natives of India and foreigners was evidently of an extremely restricted nature, and for many centuries was almost absolutely impracticable. Subsequently to the East Indian Company gaining the supremacy over Hindostan, the route by the Cape of Good Hope was still the only trade route to and from India; and we can hardly imagine that cholera, or any such disease, could be carried from Hindostan to England, by men passing over a long sea voyage of several months' duration. It was not until 1839 that steamers opened up a more rapid communication into the Red Sea, and it was some years later before any regular traffic took place by means of steamers through the Persian Gulf. We may form some notion of the development of the intercourse between Hindostan and the western world, by examining a few of the details connected with the export trade of India during the last seventy years. Major Rennell, writing in the year 1788, remarks that "the prime cost of cargo brought into England from India and China in any one year has been little above three millions, freight included. The total export from India to foreign countries amounted in—

1813-14 to	.	.	.	.	.	£4,648,104*
1823-24	.	.	.	.	.	6,279,833
1838-39	.	.	.	.	.	11,071,529†
1843-44	.	.	.	.	.	13,787,770
1853-54	.	.	.	.	.	19,023,095
1863-64	.	.	.	.	.	42,146,589
1870-71	.	.	.	.	.	56,016,408‡

* The last year of the East Indian Company's monopoly.

† The average of the three previous years.

‡ *Annals of Indian Administration*, No. 17, 1871-72.

The total exports from Bombay to the Persian Gulf amounted in—

1803-04	. . . .	9,17,198 Rupees
1817-18	. . . .	23,18,072 „
1840-41	. . . .	37,42,975 „
1860-6	. . . .	66,64,455 „
1874-75	. . . .	1,02,66,753 „

From the official returns it appears that no steamers ran between Bombay and ports in the Persian Gulf in the year 1853-54 ; but in 1855-56 nine steam vessels freighted with merchandise passed from Bombay to Bushire, in the year 1865-66 fifteen steamers made this voyage, and during the year 1874-75 no less than fifty-three steamers entered the port of Bushire from Bombay.

Before closing this chapter, it may be well to glance at the condition of Bengal and the neighbouring provinces, with reference to the means we had of gaining information regarding the spread of cholera, or other epidemic sickness among the natives of India towards the close of the last century. The following observations by Sir G. Campbell, published in his report for the administration of Bengal for the year 1873, bear directly on this subject, and I cannot do better than quote them almost verbatim from this valuable record.

The opening of the trade between England and Bengal dates back from the year 1648, when the East Indian Company's ships were first allowed to enter the River Hoogly, under a patent for exemption from customs obtained from the Emperor Shah Jehan

through the good services of Dr. Broughton of Surat, who was sent to attend the Emperor's daughter at Delhi. The English, however, possessed no territories whatever in Bengal previous to the year 1698, when Prince Azeem-u-Shar allowed the Company's agents to purchase the three villages of Calcutta, Sootamutty, and Govindpore, situated on the swampy banks of the Hoogly. In 1717 permission was granted by the Emperor Ferokhsur to the Company to purchase thirty-eight additional villages; but still the transactions of the Company were absolutely and solely of a commercial nature, and were transacted by means of natives who spoke the English language. It was not until after the occupation of Calcutta by the English in 1757 that the place was allowed to be fortified; and was in fact the establishment of the Company's territorial character in Bengal, which, in the year 1757, extended 600 yards without the Calcutta ditch, and over the twenty-four pergunnahs south of Calcutta, as far as Culpee. In 1763 the districts of Burdwan, Midnapore, and Chittagong, were made over to the English, in consideration for the assistance afforded by the British troops to the Meer M. C. Ally, under a royal grant made by the Emperor Shah Alum. After the battle of Buxar, the civil and military authorities of Bengal, Behar, and Orissa were added to the Company; but the revenue and administration of justice were left entirely in the hands of native officials until the year 1769 when Mr. Hastings appointed supervisors to superintend the native officers. The supervisors were

directed to furnish an account of the province, the state, produce, and capabilities of the land, the amount of the revenue, and how it was collected; in fact, this was the first attempt made by the Company to gain any information regarding the condition of the inhabitants of the country which they nominally governed. The reports of these supervisors showed but too plainly the profound disorder and oppression under which the people lived; and in 1772 the Company consequently resolved to take upon themselves the entire care and management of the revenues of the province; but the criminal courts were still left in the charge of native officers. Revenue boards were however established in Calcutta, and a European officer was placed in charge of each district, assisted by a staff of native officials; the duty of this officer was more immediately in connection with the collection of the revenue, but he had also power over the civil and criminal courts. Consequently, as late as the year 1773, the number of European officers in Bengal was extremely limited; and even then extended only over Lower Bengal and Behar: Beyond that to the north-west the country was absolutely a *terra incognita*. In 1787 Lord Cornwallis went out to India, carrying with him orders from the home authorities, which considerably altered the circumstances of the Indian administration, increasing the numbers and powers of the executive officers; but still the administration of criminal justice and the police remained entirely in the hands of native officials until the year 1793. And it was some years later before

the covenanted servants of the Company had any control over or knowledge of the people through the police ; in fact, even then there were not many Europeans who could converse with the natives of the country in their own language.

It is impossible for people unacquainted with India to comprehend the full meaning of the influence exercised by the police, as regards the knowledge we possess of the natives. The police are the direct and only medium of communication between the governing classes and the people governed. If a magistrate, who is virtually the head of his district, wishes to know if cholera or any other epidemic exists in a village under his jurisdiction, he applies to the police for a report on the subject ; should he desire information regarding the state of the crops, the police give him the necessary statistics ; and it was consequently absolutely impracticable for the English government before the commencement of the present century, to have possessed any definite information respecting the spread of epidemic cholera or any other disease over Bengal. We must bear in mind the fact also, that the vast regions of India extending beyond Lower Bengal and Behar were entirely beyond our control ; and we knew but little more of the inhabitants of the north-western provinces—the Punjab and Central India—then, than we do of the people living in Chinese Tartary at the present time.

We may form some notion of the changes which have taken place with regard to our possessions in

British India, from the following facts, in the year 1786 :—

The quantity of land contained in the countries subject to the British Government was—

	Square miles.
Bengal, Behar, and Orissa,	149,217
Benarès,	12,761
Northern Circars,	17,508
Jaghire in the Carnatic,	2,436
Bombay and Salfeth,	200

British square miles, 182,122

At the present time, excluding the whole of the rest of India, the province of Bengal alone contains 250,000 square miles, from which land revenue is collected.

The following is nearly the state of the Company's receipts and disbursements for the year 1786 reduced to sterling money: the Sicca rupee being valued at 2s. 1½d.

BENGAL.

Land Revenue of Bengal and Behar, 1786, £2,800,000	
Benares Revenue, clear,	380,000
Oude Subsidy,	420,000
Customs, Mint, &c., clear of charges,	120,000
Salt Revenue, ditto,	430,000
Opium,	60,000
	£4,210,000
Deduct charges of collection of the revenues } of Bengal and Behar, Nabob's stipend, &c., } £740,000	
Military charges on the Company's, and on } the Nabob's account, } £1,410,000	
Civil Establishment, Marine, and Fortifications, 390,000	
	2,540,000
	Net Revenue. £1,670,000

MADRAS.

Land Revenue, the northern Circars included, £725,000	
Carnatic Subsidy,	160,000
Tanjore ditto,	160,000
Customs, &c.,	25,000
	£1,070,000
Deduct Military charges on the Company's, } and Nabob's account, } £770,000	
Charges of collecting the revenues,	85,000
Civil Establishment, Fortifications, &c.,	130,000
	£985,000
	85,000
Total net Revenue at Bengal and Madras,	£1,755,000

Total net Revenue at Bengal and Madras		£1,755,000
At Bombay the disbursements exceed the receipts, by } about	£300,000	
And at Bencoolen (on the island of Sumatra) the } annual charges are about	50,000	
		<hr/> 350,000
Total of net Revenue in India,*		<hr/> £1,405,000

For the year 1871-72, the maritime trade of Calcutta amounted to no less than £52,468,116; and the total revenue of a single province of India (Bengal) was £17,705,092.

* *Memoirs of a Map of Hindostan, or the Mogul Empire*, by J. Rennell, F.R.S. London, 1788.

CHAPTER II.

HISTORY OF CHOLERA (A.)* PRIOR TO THE YEAR 1817.

THE early Sanskrit writers take rank among the most ancient authorities in the art of medicine. Of these, Agnivesha is believed by the Hindoos to have derived his knowledge from a mythological personage, known as Atreya, whose works are incomplete; but in the Midan of Sushruta we meet with a description of a malady called Vishuchika, the symptoms of which are identical with the cholera simplex of modern writers, and which Sushruta expressly states was a sporadic affliction. Hippocrates, Galen, and Whang-shoo-ho have left us equally vivid accounts of the prevalence of this form of cholera in the various countries in which they lived. They attributed the malady to unwholesome food, a vitiated state of the air, and to exposure to a damp cold atmosphere. But the more carefully we study the writings of these early authorities the clearer it appears that they had never met with cholera in its epidemic, or Asiatic form. The literature of the middle ages is singularly barren in original observations respecting the practice of medicine. Men exercised themselves with the ancient

* Cholera Asiatica, or Cholera (A.).

terms and notions entertained by the fathers of medicine regarding treatment, rather than in recording their own observations, and so entirely overlooked the consideration of events that were passing around them; and this is precisely what is going on at the present day among the Hindoos and Mohamedans of India. Consequently, while we have numerous treatises on the works of Sushruta and Avicenna, we have literally no clue in the oriental languages as to the history of epidemic cholera in India.

There can be no doubt that during the time when intermittent fever was prevalent in a severe form in England, and in many parts of Europe and Egypt, people were not unfrequently seized with symptoms closely resembling those of Asiatic cholera, and under these circumstances their deaths were sometimes attributed to cholera. In malarious countries (such, for instance, as the Andaman Islands) we meet with cases of this description at the present day; and in peculiarly unhealthy seasons it is quite possible that from a series of such severe cases occurring about the same time, it would appear that epidemic cholera had existed in a certain locality, supposing the medical attendant failed to recognize the distinction between that disease and instances of malarious poisoning, such as those above referred to, and to which we shall draw the reader's more special attention in the subsequent pages of this work.

Professor Hirsch contends that Asiatic cholera spread over India, Persia, and as far as Constantinople in the year 1031. I cannot, however, think that he is correct

in this opinion; at any rate, the nearest approach we have to a description of Asiatic cholera in Europe before the year 1832 is that given by Sydenham as occurring from 1679 to 1682 in London. He calls the disease cholera; but a contemporary physician of great celebrity, Dr. Wells, writing of this disorder, mentions it as being an aggravated form of dysentery, which, he remarks reigned cruelly in London, but did not extend beyond three miles of the city, the disease evidently depending as Wells surmised on some local influences, and, as he expressly observes not being communicable from the sick to healthy people. We need hardly remark that few physicians have ever brought a keener intellect to bear on the subject of medicine than Wells did, and it seems hardly possible to suppose that had the disease he witnessed in 1679 been an outburst of Asiatic cholera, he would not have recognized the fact that it differed from the form of aggravated diarrhoea or cholera simplex, which he was accustomed to see. Knowing what the sanitary condition of London and the seaport towns of England and Europe were in the fifteenth century, it seems quite certain that if cholera (A.) had appeared in places of this kind, it must have spread over the country, committing devastation infinitely greater than the plague. Nevertheless Sydenham makes no mention of a widely disseminated outbreak of the disease, and Wells expressly states that the country was quite free from the malady, and in fact that one of its characteristic features was that its ravages were confined to the City of London. It seems to me

the circumstances of this case, and others of a similar kind (such as that mentioned by Riverius, as occurring in Nismes during the year 1564)* are analogous in their relations to Asiatic cholera to that which exists between the bilious remittent fever of Bengal, and the yellow fever of the West Indies: the former, seventy years ago, was as deadly as the latter disease is now, and the symptoms of a severe attack of bilious remittent fever are very similar to those present in cases of yellow fever; nevertheless, we cannot doubt that the two affections are produced by different causes, and that yellow fever is communicable; whereas we are equally sure that bilious remittent fever is due to local influences, and is certainly not transmissible by those affected with it to healthy people.

In the previous chapter I have attempted to describe the relations existing between Europeans and the natives of India before the arrival of Vasco de Gama on the coast of Malabar A.D. 1490, from which it is evident that the inhabitants of Europe were profoundly ignorant of the circumstances of the people of India, and certainly knew nothing of the diseases from which they suffered. But no sooner had the Portuguese discovered the means of overcoming the barrier placed between them and India by the Mohamedans of Egypt and Persia, than they commenced to travel into Hindostan, and from that time we begin to gain some insight into the condition of the natives of India, and it is remarkable that in one of the very earliest communications of this

* *Annals of Cholera*, p. 47. By Dr. J. Macpherson.

description, written by a European, we have a clear and distinct reference made to Asiatic cholera, and this was the first account of the disease ever published. Doubtless, Asiatic cholera has flourished in the Delta of the Ganges, we know not for how long, but its ravages had not been witnessed by those capable of describing the disease, and it seems more than probable it had never migrated from India to Europe, as it has done in modern times, because of the difficulties of communication which formerly existed between the eastern and western worlds.

In the "Lendas da India" by Gaspar Correa, a Portuguese, he says that during the spring of the year 1503, 20,000 men had died in the army of the Zamorin Sovereign of Calicut, the enemy of the King of Cochin, and that the cause of this mortality was enhanced "by the current spring diseases, and also small-pox, *besides which there was another disease, sudden-like, which struck with pain in the belly, so that a man did not last out eight hours' time.*" *

The same author informs us that, in the spring of 1543, he met with cholera in an epidemic form at Goa; that the natives called it *moryxy*, and that the mortality was so great, that it was with difficulty the dead could be buried; "so grievous was the throe, and of so bad a sort, that the very worst kind of poison seemed there to take effect, as proved by vomiting, with drought of

* "Contribution to Literature of Cholera," by G. Gaskoin. *Medico-Chirurgical Review*, 1867, p. 222. Also refer to the Marquis of Hastings' account of cholera, as it occurred in his camp, November 1817—see the next chapter of this work.

water accompanying it, as if the stomach were parched up, and cramps that fixed in the sinews of the joints and of the flat of the foot, with pain so extreme that the sufferer seemed at point of death; the eyes dimmed to sense, and the nails of the hands and feet black and arched."

In 1563 Garçia d'Orta,* another Portuguese, gives us a vivid description of cholera as he met with it at Goa. He says the Arabs called it *hachaiza* (*haiza*), the name it is known by throughout India to this day. He adds, that the disease is always most severe in "June and July."

Linschot, a Dutchman, who resided at Goa for some few years prior to 1589, remarks that "the diseases which these changes of the season bring to the inhabitants of Goa are several, among which that commonly known as *mordexin* occurs, which comes on very suddenly to those subject to it, with swelling of the stomach and continual vomiting, till they fall into a faint. This disease is common, and proves deadly to many."†

There seems, therefore, no reason to doubt that epidemic cholera existed in Goa, the only province in India known to Europeans during the sixteenth century, and that its phenomena, and the time of its principal visitations, were precisely similar to those of the disease as seen there at the present day.

* Gaskoin "On the Literature of Cholera." *Medico-Chirurgical Review*, 1867, p. 228.

† *Quarterly Review*, 1867, vol. CXXII, p. 32.

In the seventeenth century we have evidence of the presence of epidemic cholera in Batavia * (1629), in the province of Goa † in 1638; and Thevenot was himself attacked with cholera some time prior to 1678, near Surat. About the same time we have the first description, or rather mention, of Asiatic cholera by an Englishman, Dr. Fryr, who made more than one journey to India, writes of the cholera occurring along the coast of Surat during the extreme heat.

But if we turn from the western to the eastern coast of India, we have still clear evidence as to the existence of cholera (A.) in these localities: for instance, in Lower Bengal, we find that the natives have for a long time past worshipped the goddess of cholera as the *Oola Beebee*, and I have taken considerable pains to make out the history of the worship, and have on several occasions not only visited the temple of the Oola Beebee in Calcutta, but have very good photographs of the building and of the idol it contains. It appears according to tradition, that, at an early period, the date of which cannot be now ascertained, a female while wandering about in the woods met with a large stone, the symbol of the goddess of cholera. The worship of the deity through this stone was, according to the prevailing ideas of Hindoos, the only means of preservation from the influence of this terrible disease. The fame of the goddess spread and people flocked from all parts

* *An Account of the Diseases of the East Indies*, p. 26. By Bontius. Translated and published in London.

† *Quarterly Review*, vol. CXXII, p. 33.

of the country to come and pray at her shrine in Calcutta.

As is usual in such cases, the idol became the property of a priestly family and a source of income.

Originally the idol was kept merely under a bamboo shed; but early in the eighteenth century, probably about the year 1720, an English merchant to please his native friends, built a temple to the goddess which still exists in a ruinous state.

Of the rites performed at the shrine we know that, besides presenting offerings, the votaries of the goddess fasted in the morning, and at two o'clock in the afternoon dined upon crushed rice and *dhahee*, a preparation of milk, taking nothing after that until next day. Every Tuesday and Saturday some three or four hundred females used to worship after this fashion, and return to their respective homes in the evening. The pilgrimage was especially common from April to June, or during the cholera season.

In process of time the temple became inconvenient from its situation, and Mr. Duncan gave 6,000 rupees for the erection of the edifice which is now in use; it was built probably about the year 1750: near it is the tomb of Mr. Duncan's Mohamedan wife and child.

The old rude stone was transferred to the new temple, and a somewhat elaborate idol constructed; it represents in the centre a carcass, with a vulture preying on it, and on the back of the latter the goddess is represented with four hands and in a sitting posture; on her right is

Munsha, the goddess of serpents ; next to her is Shiva, the destroying principle ; next comes a female in a suppliant posture, and a male afflicted with the disease. The female is supposed to be praying to Shiva for the recovery of her husband. On the left of the goddess are the idols of Sheetola, the goddess of small-pox, and of Shusthee, the goddess presiding over infants and children.

The temple continues to be the property of the family that originally possessed it, but it is by no means so lucrative now producing hardly an income of 300 or 400 rupees a year.

From this curious history we are entitled to infer, although cholera may not have been so prevalent in India in the commencement of the eighteenth, as it was in the seventeenth century, nevertheless, for years past it has been a well-known disease in Bengal. It seems also certain that the malady must have raged at times with violence, or it would not have been found necessary to propitiate the Deity specially on account of it. *

Records of cholera in India from the English occupation until 1817.—One of the earliest accounts of the occurrence of cholera in India from the pen of an English physician (Dr. Paisley), is dated Madras, February, 1774, and is to be found in Curtis's *Works on Diseases of India*, published in Edinburgh in 1807. It is somewhat remarkable that this important communication should not have been brought to light until thirty-three years after it was written, particularly as in the meantime Dr. Girdlestone had published a work in London, in 1787,

* *Annals of Cholera*, J. Macpherson, p. 117.

on the *Spasmodic Affections of India*, under which heading he gives an accurate description of cholera. It is evident, therefore, that, in spite of Dr. Paisley's letter, neither Girdlestone nor "a general meeting of the Faculty at Madras" which he consulted in 1782, recognized the disease we now designate Asiatic cholera by that name.

I am anxious to bring this point somewhat prominently forward, not as a proof of ignorance or neglect on the part of the authorities whom I shall quote, for they had a perfect right to follow Cullen's nosology, and class cholera under the heading of spasmodic affections if they pleased; but, supposing this were the case, we can hardly be surprised at failing to meet with a description of it as cholera (A.) among the writings of English physicians in India, during the latter part of the eighteenth and the beginning of the nineteenth centuries.

In 1774 Dr. Paisley writes : *—"I am happy to hear you have occasioned the army to change its ground, for there can be no doubt from the circumstances you have mentioned, that their situation contributed to the frequency and violence of the attacks of this dangerous disease, which, as you have observed, is true cholera morbus, the same they had at Trincomalee." (In a footnote Dr. Curtis remarks that this must refer to some occasion long anterior to the war of 1782.) Dr. Paisley goes on to observe that it is often epidemic among the natives. "In the first campaign made in this country,

* *An Account of the Diseases of India*, p. 85. By C. Curtis, formerly Surgeon to the "Medea" frigate. Edinburgh, 1807.

the same disease was terribly fatal among them, and fifty Europeans of the line were seized with it. I have met with many single cases since." In 1770 cholera was endemic among the natives in the Amboo Valley in Arcot, and throughout the Travancore country.*

In 1781 we find cholera prevalent during the month of March in the district of Ganjam. It attacked a division of some 5,000 Bengal troops marching through that province under Colonel Pearse. He reports that besides those who died, no less than 500 men were admitted into hospital on the 22nd of March. He further adds: "Death raged in the camp with horror not to be described, and all expected to be devoured by the pestilence. In vain I studied to discover the cause of our misfortune. I attributed it to a poison, but at length found that there had been a pestilential disorder raging in the parts through which our first marches lay, and that part of our camp was already drinking the air of death and destruction." In the course of a few days 1,143 men were in the hospital affected with this disease. On the 26th of March, however, the sick were reduced to 908, and on the first of the following month the force was able to march, leaving 300 men convalescent behind.

It will be observed that Colonel Pearse does not mention the disease as cholera; he calls it a pestilence, and in the following quotation from a despatch of the Supreme Government to the Court of Directors, no mention is made of cholera. This document is dated 27th April 1781; the occurrence of the disease is

* *An Account of the Diseases of India*, p. 16.

notified, and the destruction which it caused in this detachment mentioned in terms of becoming regret.* After adverting to its progress in the Circars, the despatch proceeds: "The disease to which we allude has not been confined to the country of Ganjam; it afterwards found its way to this place (Calcutta); and after chiefly affecting the native inhabitants, so as to occasion a great mortality during the period of a fortnight, it is now generally abated, and pursuing its course to the northward." Here, unfortunately, a blank occurs in the history of this epidemic of cholera; but we find that in April 1783 cholera burst out at Hurdwar, and in less than eight days is supposed to have cut off 20,000 pilgrims; and at the same time the Mahratta armies engaged in war with Tippoo Sultan suffered severely from the disease. Hurry Punt, the Mahratta general, writes, "The loss sustained by the army in consequence of cholera morbus is very great."†

Dr. Girdlestone remarks: ‡ "Spasms was the first disease which appeared among the troops who arrived at Madras in October 1782. More than fifty of these men were killed by them within the first three days after they landed in that country, and in less than a month's time upwards of a thousand had suffered from attacks of these

* *Report on the Epidemic Cholera Morbus as it visited the territories subject to the Presidency of Bengal.* By James Jameson, Calcutta, 1820.

† *History of the Mahrattas*, p. 15. By Grant Duff.

‡ *Essays on the Hepatitis and Spasmodic Affections in India.* By J. Girdlestone, M.D. London, 1787.

complaints." He goes on to describe the disease thus : 'There is "coldness of the surface of the body, especially of the hands, feebleness of the pulse, spasmodic contraction of the lower extremities, the hands and feet become sodden with cold sweats, nails livid, pulse more feeble, breath cold, thirst insatiable, vomiting incessant, which last if not checked, soon terminates the existence of the patient." This is evidently an account of the disease we recognize as epidemic cholera.

Fra Paolino de S. Bartolomeo also, in a work published at Rome in 1796, gives a curious account of cholera.* He says : "The disease is called *mirtirissa*, or *nircomben*, in the language of Malabar, *viszucega* in Sanscrit, vulgarly *mordexein*, and not *morte de chien* as described by Sonnerat. It is an intestinal colic caused by the cold wind from the Ghattes, or from bathing in the cold mornings. This disease is frequent in Malabar in October, November, and December, when the wind comes from the Ghattes loaded with particles of nitre ; it is as common on the Coromandel Coast in April and May, and often carries off thirty or forty persons in a village during one night ; for, unless instantly relieved, it destroys life in the course of a few hours. In 1782 the disease broke out with terrible ferocity, and destroyed an enormous number of people."

In the month of May 1782, cholera was raging in an epidemic form at Trincomalee, and our fleet at anchor there was severely affected. M. Sonnerat,† in his

* *Viaggio alle Indie Orientali*, p. 305.

† Scott's *Madras Reports*, p. iv.

Travels in India, also mentions the presence of epidemic cholera along the Coromandel Coast from 1772 to 1782 ; and Dr M'Rae from personal observation in these parts from 1790 to 1817 corroborates this statement. So that we have evidence of the existence of epidemic cholera in the Circars during the early months of the year 1781, that it extended from Ganjam to Calcutta, and from thence pursued its course northward ; it broke out with great violence at Hurdwar and in Central India during the month of April 1783. If we trace the disease from Ganjam southward, we find it expressly affirmed by independent authorities that Asiatic cholera was most deadly in 1782 along the whole of the eastern coast of India, and that it visited Madras in October 1782, killing more than fifty of the recruits who had just landed in the country in the course of a few days ; and the epidemic extended as far south as Ceylon, appearing among the men of our fleet at anchor in the harbour of Trincomalee, thus indicating the course of the first great outbreak of epidemic cholera in India since the occupation of the country by the English. In fact the Rev. Father Sangermano, who was sent to Rangoon in July 1783, expressly says that Asiatic cholera not only existed in Burmah during that year, but that it spread all over India.* It seems that the reason for our not possessing clearer indications of the course the disease followed, and other circumstances attending this outbreak,

* Dr. John C. Peters, of New York, *A History of the Travels of Asiatic Cholera*, p. 529. "Cholera Epidemic of 1873 in the United States."

is because at the time the malady was hardly recognized as cholera (A.) by English medical men: and it was not till 1786 that the hospital Board was established in Bengal and Madras, before which period no returns of the sick, whether of Europeans or native soldiers, were made. Mr. Scott adds, that the reports from that date up to 1802 were kept in no regular order. Moreover our possessions in India, prior to 1781, were surrounded by large provinces regarding whose inhabitants we had literally no knowledge whatever; into these territories the course of the epidemic could not possibly be traced; but the details above given are, nevertheless, important, as evidence of the passage of epidemic cholera over a considerable portion of Hindostan within twenty-four years of the battle of Plassey.

During the month of October 1787 and in 1794, epidemic cholera committed terrible ravages at Arcot and Vellore.* And again in the year 1790, it was very prevalent in Ganjam.

From the returns kept in the office of the Bengal Medical Board during the early part of the present century, and which relate exclusively to the European troops, I find that in 1808 five cases of cholera are reported. In 1809 three cases occurred, and in 1811, 1812, 1813, no less than seventy-nine cases of cholera are reported as having taken place at Chunar. During the year 1814 instances of cholera occurred at Cawnpore, Nagpoor, Benares, and Dinapore; in all forty-six cases, and eleven deaths. These are the first deaths

* Scott's *Report*, p. xii.

reported from this disease among our European troops in Bengal. In 1815 and 1816 there were no cases reported; and only two deaths from cholera occurred among the troops at Benares during the year 1817, although the disease was raging throughout the whole of Bengal, showing that statistics referring only to the condition of our European troops are not to be relied upon as a criterion of the prevalence of cholera in India.

The disease appeared in a crowded barrack in Fort William, in 1814, among recruits just arrived from England;* and in an epidemic form at Jaulna during the same year. With regard to this latter outbreak, Dr. Cruickshanks subsequently explained (in 1831) that "he entered these cases in the Hospital Returns as bowel complaint in 1814, because the matter ejected by vomiting and stool was of an aqueous or mucilaginous consistency, containing no bile." Mr. Scott observes with regard to this report: "This paper of Mr. Cruickshanks is of great importance, inasmuch as it evinces that cholera did exist to an extent not hitherto suspected to have occurred at so recent a date, and also that, even under these circumstances, no trace of it is found in the public records; for, unless we had been guided by the incidental remark of Dr. Duncan, made five years after the occurrence, and had most fortunately been able to refer to Dr. Cruickshanks,

* *A Concise Narrative of Facts connected with the Disease which occurred in the District of Jessore.* By R. Tytler. Calcutta, September 1817. Printed by C. M. Pratt & Co.

the medical returns of the corps never could have led to the knowledge of it. Hence, as already observed, though cholera very rarely appears in the sick returns of former times, it is no by means to be thence inferred that it did not then exist."*

We are therefore, I think, justified in arriving at the conclusion that it was nothing new for cholera (A.) to spread over India in an epidemic form prior to 1817 and 1819. The nature of the disease was then for the first time fully recognized, and as the greater portion of the country had passed under our rule, English Officers were in a position, for the first time in the history of India, to trace the progress of the disease over the length and breadth of the land.

Dr. J. Macpherson, who has thoroughly worked out this subject in his *Annals of Cholera*, cites no less than sixty-four independent authorities who make mention of having been cognizant of the presence of cholera (A.) in India from the year 1503 to 1817, and of these authorities ten refer distinctly to epidemic outbursts of the disease. It seems to be unreasonable to expect that we could have been more accurately informed of its circumstances prior to the last mentioned date, on account of the position we then held in the country, as I have explained in the first chapter of this work.

It may be well to remark that the MS. Proceedings of the Medical Board, to which I shall so frequently have to refer in this volume, consist of a series of day books, in which entries have been made regarding the

* Scott's *Report*, p. ix.

current work of the Office from the year 1800 to 1842. These records, therefore, are particularly valuable in tracing the history of a disease such as we are now considering, because they give us the opinions entertained by the members of the Board at the time the events brought to their notice actually occurred,—ideas which might very probably have undergone considerable modification if recorded at a subsequent period, and reviewed by the light of further experience or knowledge of the matter in hand. This fact is well illustrated by the correspondence regarding the outbreak of cholera in 1817.

CHAPTER III.

THE EPIDEMIC CHOLERA OF 1817-23.

THE earliest notice of the epidemic I am about to describe is to be found in the MS. proceedings of the Calcutta Medical Board, in a letter from Dr. Tytler, civil surgeon of Jessore, to the judge of the district, dated 23rd August 1817. He writes: "An epidemic has broke out in the bazaar, the disorder commencing with pain or uneasiness in different parts of the body, presently succeeded by giddiness of the head, sickness, vomiting, griping in the belly, and frequent stools. The countenance exhibits much anxiety, the body becomes emaciated, the pulse rapidly sinks, and the patient, if not speedily relieved with large doses of calomel, followed by one of opium, is carried off within four and twenty hours."* As the disease was spreading rapidly, and the natives were panic-stricken and rushing from the town, the judge thought it advisable to close his court, and immediately reported the circumstance to the supreme government, enclosing a copy of Dr. Tytler's letter. Upon receiving this communication, Mr. W. B. Bayley,

* MS. Proceeding of the Bengal Medical Board for 1817.

at the time secretary to the Government of India, forwarded it to the Medical Board, urging them to give the matter their immediate attention and to advise the Government on the subject. In their reply (the 6th of September 1817) the members of the Board remark "that the disease is the usual epidemic of this period of the year, increased perhaps in violence by the peculiarities of the present season, and not improbably by certain local causes affecting the health of the inhabitants of Jessore. It is understood that in certain quarters of Calcutta a similar epidemic prevails; and it is probable that there is no considerable town in the low and humid climate of Bengal that is at present entirely exempt from its operation. The obstruction to ventilation in native towns from rank and luxuriant vegetation powerfully aids the influence of the season; and as this cause may operate in a greater or less degree in different places, the prevalence and fatality of the epidemic will probably be increased or diminished.

"A great alarm seems to have spread itself among the natives of Jessore, which the suspension of public business by the magistrate would not be calculated to check, though there is no doubt, however, that apprehension may aid as well the diffusion as violence of an epidemic; yet it is probable that the consequences arising from that cause may in the present instance have been beneficial, correcting the influence of an overcrowded population."

I have quoted this letter at length, because it appears to me not only an important document as bearing upon the history of cholera, but also gives us an idea of the

recognized views of the etiology of the disease held by Indian medical authorities in 1817. It will be observed that the members of the Board, who had probably served in the country some twenty years prior to the date of their letter, remark that the disease is *the usual epidemic of the season*; we may conclude, therefore, that they were perfectly familiar with its phenomena; but throughout the original correspondence, neither the Government, the Medical Board, nor Dr. Tytler mention the epidemic as cholera. Curiously enough, the first notice we have of this fact is in a letter from the magistrate of Calcutta forwarded to Government on the 16th of September 1817. He observes that "a disease is prevalent in the town and suburbs of the species of cholera morbus." This statement having been sent on to the Medical Board, they declare the disease to be cholera morbus, and that "it generally prevails to a greater or less degree at the present season of the year. It has, however, of late been far more fatal than at any former period within the recollection of the oldest inhabitants, running its course generally in a few hours, and sometimes in a few minutes," * features which, nevertheless, had been ascribed to it centuries before by the Portuguese at Goa, and in other localities.

We have reports regarding the existence of cholera at Patna and Mymensing in July 1817, and in Calcutta early in August. At this time it also appeared at Dacca: on the 23rd of the month it was raging throughout Jessore, and in Chittagong on the eastern side of the

* MS. Proceeding of the Bengal Medical Board for 1817.

Bay of Bengal; * at the same moment it appeared in Rajeshahye, a central district lying east of the Ganges, and afterwards in the high and distant tracts of Bhaugulpore and Monghyr. By the middle of September the inhabitants of Purneah, Dinagepore, Balasore, and Cuttack were affected. On the 17th it had spread to Buxar, Chupra, and Ghazeepore. †

In October the districts of Berhampore and Rungpore came under the influence of cholera; and, in fact, within three months from its appearance the disease had been generated throughout the Province of Bengal, including some 195,935 square miles, and within this vast area the inhabitants of hardly a single village or town had escaped its deadly influence. There were some remarkable exceptions to this rule; as, for instance, in the city of Moorshedabad, which appears upon good authority to have been entirely free from cholera during the year 1817, although the disease prevailed in every direction around it.

Early in November cholera broke out in the district of Mirzapore. Towards the middle of the month it was at Rewah; but previously to this had appeared in the Marquis of Hastings' camp in Bundelcund. The first cases were reported as having occurred on the 7th and 8th of the month; it then burst out with irresistible fury among the troops and camp followers. "The whole camp put

* Dr. Mac Rae, writing from Chittagong, November 1818, states: "I had constant opportunities of observing it, as it prevails in this district more or less every hot season."

† Jameson's *Report*, p. xi.

on the appearance of an hospital; the dead were left unburied; the natives deserted in flocks, and some of the Governor-General's servants dropped down dead behind his chair, (?) and the Marquis himself was apprehensive of dying here; so that he gave secret instructions, should the event occur, to be buried in his tent.”*

We may, however, reproduce the Marquis of Hastings' remarks on this outburst of disease, they are the more valuable because they are to be found in the diary which he was in the daily habit of keeping at this period of his life; the Governor-General writes:—†

“13th November 1817. Camp Talgong. The dreadful epidemic disorder which has been causing such ravages in Calcutta and in the southern provinces, has broken out in camp. It is a species of cholera morbus, which appears to seize the individual without his having had any previous sensations of the malady. If immediate relief is not at hand, the person to a certainty dies within four or five hours. An extraordinary prostration of strength is an almost instantaneous symptom of the disorder.

“14th November. Ninety-seven deaths are reported to me as having occurred during yesterday forenoon. There is an opinion that the water of the tanks, the only water which we have at this place, may be unwholesome and add to the disease; therefore, I march to-morrow, so as to make the Pohooj river, though I must provide carriage for above 1,000 sick.

“15th November. We crossed the Pohooj this morning, and encamped on its eastern bank. The march was terrible, for the number of poor creatures falling under the sudden attacks of this dreadful infliction, and from the quantities of bodies of those who died in the waggon, and were necessarily put out to make room for

* *A Treatise on the Epidemic Cholera.* By F. Corbyn. Calcutta, 1832.

† *The Private Journal of the Marquis of Hastings*, Vol. II, p. 238. By the Marchioness of Bute. London, 1858.

such as might be saved by the conveyance. It is ascertained that above 500 have died since sunset yesterday. Ten of my own servants are among the number. The ground we are on is sandy and dry, with the benefit of a running stream convenient to the camp. It is evident that this is the same pestilence as has been raging in the lower provinces. We have information of its gradually ascending the river to Patna, Ghareepore, Benares, and Cawnpore.

"16th November. This day has exhibited an apparent abatement of the contagion; that is, the cases sent to the hospital tent have been fewer, and the quality of the attacks less severe. As I rode through different quarters of the camp in the morning, the scene was heart-breaking: numbers of dead and dying camp-followers met the eye in every direction.

"17th November. Still little improvement; this morning many deaths have taken place among the Europeans and Sepoys. The surgeons press me to remain on this ground another day. Of course, I accede to their wishes, though I think the encamping on the banks of the Betwah, a large and limpid river, would have material effect on the spirits of the people.

"18th November. No apparent good has been obtained by our remaining here.

"19th November. We achieved a march of 15 miles. The camp is divided into two parts by the Betwah, a broad, clear stream, with lofty banks, and which is fordable at Erick.

"20th November. There is thus far a favourable change; that far less cases, in proportion to former cases, have been sent to hospital.

"21st November. There is an unquestionable diminution in the activity of the pestilence.

"22nd November. No one who has witnessed the dismay and melancholy which have lately visited our people, can comprehend my sensations on hearing laughter in the camp this morning."

From that day the cholera disappeared from the Marquis of Hastings' camp, leaving those whose duty it was to attend to the sick in a state of amazement. If, as some contend, the disease was contagious, why should it cease in this way? for they carried numerous

infected people with the camp to the River Betwah, though it is true they left the greater part of the hospital behind them. Others supposed the cholera depended on some peculiar condition of the atmosphere. What had been the changes in its condition between the 18th and 20th of November? No one could answer this question.

But it is not to be supposed that this terrible outburst of cholera was confined to the camp of the Governor-General; on the contrary, it spread throughout Bundelcund, pursuing a south-westerly direction, and devastating almost every village and town in the province.

During the months of December, January, and February, there was a decided lull in the virulence as well as in the advance of the epidemic, but its influence by no means entirely ceased; for, in the majority of the districts in which it had been generated, we hear of cases of cholera having occurred throughout the cold season.

During the year 1818 cholera spread over the greater part of India, invading districts which had previously escaped, and being reproduced in those already devastated by it; so rapidly was it engendered in various directions, that it is somewhat difficult to describe its progress. We may probably best consider its advance under the following divisions:—

1st. To the north-east of the Ganges from the district of Tirhoot as far as Bareilly.

2nd. From Central India, north-west, west, and lastly southward into the Deccan.

3rd. From Gamjam, along the eastern seaboard, and a considerable portion of the western shore of the Peninsula.

1. During the cold season of 1817-18 cholera appears to have been absolutely in abeyance throughout the districts to the north-east of the Ganges; but in April and May 1818, it burst out with terrible violence in Tirhoot, Chupra, and Goruckpore, extending northward into Nepaul, and rapidly visiting Oude and Azimgur to the west.

The inhabitants of Benares were under the influence of the epidemic in April, but did not suffer severely from it. Towards the end of March it appeared at Allahabad, destroying 10,000 of its population; but the troops were not attacked by the disease until the middle of July; nevertheless they were in daily and unrestricted intercourse with the townspeople. Not a single case of cholera occurred within the precincts of the jail, although 700 prisoners were confined within its walls, the convicts working in the streets of the infected city during the daytime.* On the 8th of April, Cawnpore, Bithoor, and the adjoining villages were affected, the disease remaining in full force for some fifteen days; it visited Furruckabad in May, but appeared little disposed to extend in that direction. Bareilly, Moradabad, and almost every other town in the same line enjoyed their wonted health. The town and district of Shajehanpore formed a remarkable exception to the general healthiness of the Province of

* Tytler "On Cholera," *Lancet*, vol. I, p. 112.

Bareilly. There the disease appeared in July, and is reported to have killed upwards of 5,000 of its inhabitants.*

2. We may now trace the progress of the epidemic from Bundelcund, in which province it was reproduced in March and April 1818. In May it had extended in a north-westerly direction to Etawah, visiting only one or two isolated spots in the Dooab. It was at Muttra early in June, and at Agra in July. On the 20th of the month it was generated at Delhi, and on the 28th at Meerut, skipping over all the intermediate towns and villages, but remaining in the above named localities for a month or so, and then gradually disappearing. On the 23rd of July, a body of European and native troops marched from Meerut to Hansi. They were perfectly free from disease, and passed through Delhi on the 29th (the cholera being then at its height in the town), encamping outside its walls about a mile to the west. They continued their march to the north-west on the 30th, and on the 31st the epidemic appeared among them. On the 6th of August they joined the force at Hansi, and almost immediately afterwards cholera broke out among the entire brigade, and accompanied them to Futtihabad, Rhaunce, and Sirsee. It was the general belief among the medical officers serving with this force that the troops from Delhi had brought the cholera with them, and propagated it through the general camp at Hansi.†

Mr. Jameson traces the cholera on as far as Seha-

* Jameson's *Report*.

† Jameson's *Report on Cholera*.

runpore, where, he says, the "high ridge of mountains, which in other quarters proved hostile to its propagation, here opposed its further progress, and saved the inhabitants of the hilly district from a scourge which, in their circumstances of poverty and nakedness, would probably have proved exceedingly fatal to them." This inference was of course drawn from the information at Mr. Jameson's command when he wrote his report ; but it is to be observed that eighteen months later (in May 1820), Moorcroft incidentally mentions the existence of cholera of a virulent type to the north-west of Lahore,* which in all probability was a continuation of the invading cholera we have been tracing from Bundelcund into the north-western provinces of India and the Punjab, for Sir Richard Temple informs us that the Punjab was visited severely by the disease in the year 1820.†

From Bundelcund the cholera spread into the districts of Saugur and Nagpore during the months of April and May 1818, and may be traced westward to Bhopal, and Oujein, which it reached on the 9th of May. In June it appeared at Kotah, but does not appear to have crossed the Aravulli mountains. The epidemic extended from east to west along the valley of the Nerbudda and Tapti rivers. We find it early in April at Mundlah and Mooltae. On the 15th of May it was at Nagpore. In

* *Travels in the Himalayan Provinces of Hindustan and the Punjab from 1819 to 1825.* By W. Moorcroft. London.

† *The Localities in India exempt from Cholera*, p. 78. By Surgeon Edward Balfour. Madras, 1856.

this quarter it, as usual, gave evidence of its capricious nature ; it was not met with between Nagpore and Mooltae, a distance of seventy miles ; and Bantool, a large town in the direct road from the river to Mooltae, was entirely exempt from its visitation. * On the 3rd of July the disease was in full force at Jaulna. In the province of Candeish, where there is not sufficient population, and but little intercourse between the villages, its progress was slow ; it appeared in the capital of the district in the middle of July, and at the end of August at Surat. Dr. Kennedy says the disease was imported from the former to the latter place by a body of prisoners. "At Punderpoor, to the south of Bombay, it happened to break out at the time of the great jatra or fair, and was spread at once in all directions by the pilgrims returning to their homes. The poison would seem to have been more concentrated there from there being so many sources of production ; the number of deaths in a few days was estimated at 3,000, and the patients were described as having been knocked down dead as if by lightning." †

After visiting Aurungabad, and Nassick, it reached Seroor on the 18th of July, and towards the end of the month appeared at Poona. On the 6th of August it broke out with great violence at Panwell, a considerable village on the main line of communication between Poona and Bombay, separated from the latter by an arm of the

* Jameson's *Report*.

† *Report on the Epidemic Cholera of 1818*, p. 151. Published under authority of the Government of Bombay, 1819.

sea, and distant fifteen or twenty miles, but between which a pretty constant communication is kept up by means of boats. On the 9th and 10th of the same month the first case appeared on the Island of Bombay, and could be traced to a man who had arrived from Panwell the same day; it also spread north and south along the sea coast from the same place, and was imported into a village in the neighbourhood of Tannah, on the Island of Salsett, by a detachment of troops that escorted a state prisoner to that garrison from Panwell. The disease did not break out at Maleni on the extremity of the island, distant only five or six miles from the principal native town of Bombay, until it had been established in the latter; it then gradually spread over the Island of Salsett, through which the road from Bombay to Surat and the northern countries lies, and by which, during the south-west monsoon, is the principal line of communication. *

It will be observed that the cholera had extended steadily from east to west through the Presidency of Bombay; and Dr. Jukes remarks, in July 1818, that it was hoped in Bombay, that as the disease had for some months been moving gradually south-west, borne along as it were by the north-east monsoon, that it might be checked by the violent south-west gales which blow on our coast during that season. † In spite, however, of these opposing storms, the cholera marched forward, and having arrived at the coast, spread through the Concan.

* *Bombay Cholera Report*, p. 9.

† *Idem*, p. 171.

We must now return to Nagpore, where, as already observed, cholera had made its appearance among the inhabitants of the city and neighbouring villages in May.

Throughout the early part of the year 1818, a considerable body of Bengal and Madras troops had been engaged in the siege of Chundah, a town situated some seventy miles south of Nagpore. The men employed in the arduous operations of this siege escaped the cholera, notwithstanding the excessive heat and many privations they had to undergo. Their work having been accomplished, they were ordered to march to Nagpore, and on the 30th of May arrived at Gaongong, a village nine miles south of the city. Here they had hardly learnt that the epidemic was raging in the vicinity, when they began themselves to experience its unwelcome visits. As usual, its first assaults were most severe. Many of those attacked whilst loitering for water in the neighbouring rivulets, were brought in expiring; some dead. Of seventy cases admitted during that night and the succeeding day, about twenty died. On the 31st the instances of attack were equally numerous, but in these the exhaustion was not so sudden, and the subsequent symptoms were less severe. On the 1st of June the division moved from Nagpore towards the cantonments of Hoshungabad. The malady then gradually declined, and almost entirely disappeared on the 17th and 18th, after some seasonable falls of rain.*

Early in June the cholera had reached Hingumghat, fifty miles to the south of Nagpore, and a few days later

* Jameson's *Report*, p. 23.

it spread to Chundah. The disease first appeared at Jaulna, on the 3rd of July, and from that date until the 11th of the month it prevailed both among Europeans and natives, disappearing before the end of July 1818.

The cholera broke out at Hyderabad towards the end of July, and at Gooty on the 6th of October; it visited Bellary on the 8th of September, and had declined in severity towards the beginning of October. About the 20th of that month it broke out again with its former violence among the troops and inhabitants of the town, and did not disappear till November. Of 500 persons in the jail, however, only one was affected, and he recovered. The jail is situated about twelve hundred yards eastward of the fort, where the disease was very prevalent.

The epidemic appeared at Bangalore on the 22nd of October. On the 6th of November it broke out at Seringapatam, which being a sink of nastiness,* the mortality among its inhabitants was very great indeed.

3. We may now trace the course of the cholera of 1818 along the seaboard of the peninsula of India. In the district of Ganjam, cholera sprung up with renewed energy during the months of March and April; in May it appeared at Vizgapatam, and in July at Masulipatam. It was generated among the northern villages of Nellore early in August, but did not reach the southern part of the district, a distance of 180 miles, until the 5th of October. Mr. Scott remarks that its progress southward from Ganjam to Nellore, against the south-west mon-

* Thornton's *Gazetteer of India*. London, 1875.

soons, was much slower than from the latter district to the remaining southern portion of the coast, after the wind had set in from the N.E.

On the 5th of October other cases of cholera were met with in the town of Madras.* The disease was noticed among the inhabitants of Nagore about the 10th of November, and at Madura on the 30th of the month.

I have already noticed the fact of cholera having appeared on the western coast at Surat, Bombay, and throughout the Concan during the latter part of August 1819; it was at its height in September and October, and at the same time Calicut and Allespe suffered; it spread to Tillicherry in November, and revisited Bombay—and, in fact, the whole of the western coast during the year 1820. The English government were at this time anxious to preserve themselves from being drawn into the quarrels of Said-Bin-Sultan, the ruler of Oman; but the fates appeared to compel the Governor-General to interfere, and at length Captain Thompson was despatched with a small force of 400 native troops from Bombay to Arabia, to the assistance of the Imaun. I need hardly remind the reader of the fate of this unfortunate expedition: nearly the whole of the officers and men perished by the hands of the enemy. But early in the following year, Sir Lionel Smith was sent from Bombay with a considerable force of European and native troops. They landed at Sur, and, in conjunction with the troops of the Imaun, entirely routed the enemy on the 2nd

* Scott's *Report on Cholera*, p. 46. Madras, 1824.

March 1821. After blowing up the works of the enemy, the forces returned to Sur and re-embarked for India. It was asserted shortly after the completion of this expedition that cholera (A.) had accompanied our troops from Bombay to Arabia, and that this disease had thus extended from India to Oman. It is quite certain that the Arabian historian Salil-ibn-Razik gives us a clear description of cholera (A.) in the following passage: he writes, "This year (A.D. 1820-21) a plague broke out in Oman and proved fatal to a great many. This plague differs from that which occurs at Constantinople, Bagdad, and Bassora. It first attacks a man's abdomen, and this matter is ejected from the mouth and anus till he dies. Some who are seized die at once; others after two or three days; and only a few survive. God preserve us from so dire a disease! Great numbers in Oman fell victims to it; it prevailed also in India, in Sind, and Mekrain." * At this time so little were the natives of this part of Arabia and the Hadjis acquainted with cholera (A.), that they had no specific name by which to define it.

Mr. Fraser arrived at Muscat on the 8th of July 1821, and he remarks that, during a visit the Imaum paid the envoy, "he confirmed a report which had before reached us of the epidemic cholera having visited Muscat, where it had committed considerable ravages. His Highness informed us that he had lost by the disease at least ten thousand of his subjects; that Muscat had by no means

* *History of the Imauns and Seyyids of Omaun*, p. 344. By Salil-ibn-Razik. Translated by G. P. Badger.

suffered most, as it had extended over the greater part of Oman." *

On the 18th of July Mr. Fraser's party arrived at Kishmee, where epidemic cholera was raging. Many of the inhabitants had fled to Meenab, to find the disease still fiercer in that locality. Cholera had by this time reached Bunder Abbassee and Bahrein. On the 20th of August it broke out at Bushire; and on the 29th was heard of at Cauzeroon (Kazerun) and Sheerauz (Shiraz), in which latter place it first appeared in the prince's harem. The disease was very severe in this locality, and our author's companion, Mr. Rich, here died of cholera. From Shiraz it was carried north to Jedz and Teheran, and from thence to Resht, at the foot of the Caspian Sea.

Bassora is the principal and only port at the head of the Persian Gulf. Cholera appeared there with extraordinary violence in 1821. From 15,000 to 18,000 persons died from it in eighteen days. From this city the disease was carried by boats and caravans up the Tigris to Bagdad, which became affected, with the surrounding country. †

A war had broken out at this time between Persia and Turkey, arising from the insult offered to Persian pilgrims going to Mecca, and Mahomad Aly Mirza led his army in person against Bagdad; but just as he was on

* *Narrative of a Journey into Khorasan in 1821 and 1822*, p. 21. By J. B. Fraser. London, 1825.

† *A General Sketch of the History of Persia*, p. 393. By C. R. Markham, C.B., F.R.S. London, 1874.

the point of possessing himself of the city, he was carried off by cholera, and his army suffered frightfully from the disease. The malady died away at the approach of the winter of 1821. In the spring of 1822 it again broke out suddenly along the Tigris and Euphrates. A Persian army defeated the Turks on the 3rd of August, near Erivan, and the Persians pursued their enemies to within two days march of Erzerum, when cholera broke out in the victorious army with terrible violence, so that the troops retreated with terror to Khoi, where they began to disperse, disseminating the disease throughout the country. It was intensely severe at Tabreez, and was thus introduced into Tauris from three directions—from Teheran to the east, Ispahan to the south, and Bagdad in the west—and one-half of the whole remaining population, or 4,800 persons, died in twenty-five days. From Tauris the disease was transported farther up between the Black and Caspian Seas to Tiflis, and thence to Astrakhan, where it had already arrived by water from Resht, the principal port on the southern shores of the Caspian Sea. It is quite certain that the Russian government at this time put forth all their strength to check the diffusion of cholera into the neighbouring provinces from Astrakhan; it is impossible to determine how far these efforts were the means of preventing its extending to the north, but the disease certainly did not advance during this epidemic beyond Astrakhan into Russia.

Avoiding the desert, the malady accompanied the caravans which traverse Merdine, Mosul, Diarbekir, Orfa, Bir, and Antab; and having crossed the Syrian

frontier in this direction, it reached Aleppo in the beginning of November. We have the authority of the French Consul for asserting that the irruption of the malady was coincident with the arrival of the caravans in all these towns.* M. de Lesseps, the French Consul at Aleppo, on the approach of the cholera took refuge with some two hundred friends in his country house, and planted themselves in a regular state of siege during the period cholera lasted in the place. This party escaped the disease, as did also M. Guys and his friends under similar circumstances at Lattaquia. As the epidemic was threatening to enter Egypt through Syria, the Pasha applied to the Supreme Board of Health of Paris for directions, by which the fatal junction of the Indian cholera with the plague might be prevented in the valley of the Nile. The Board transmitted the necessary rules, which were strictly enforced by his highness;† and cholera did not pass beyond the confines of Syria towards Egypt.

In 1823 cholera broke out at Alexandretta, and reappeared in most of the places it had visited during the preceding year, being also generated in several of the seaport towns on the Caspian. In June 1823 the disease showed itself in the neighbourhood of Laodicea and Antioch, and then spread along the borders of

* *Rapport au Conseil supérieur du Sauté, sur le cholera morbus pestilential.* Par A. Moreau de Jonnés, Membre et Rapporteur du Conseil. Paris, 1831.

† Ibid.

the Mediterranean; but entirely disappeared again, both there and on the shores of the Caspian,* towards the close of the year; nor do we hear of its reproduction, or, in fact, of its existence, in Persia or Turkey during the five succeeding years.

It is without doubt an inexplicable circumstance that cholera should have been hanging about the territories bordering on the Levant for three years, with only a nominal quarantine to stop it, and ample means of communication open, through which it might have spread into Turkey and Europe, supposing human intercourse to be the ordinary means by which the disease is propagated.

We must now return to the history of the epidemic cholera of 1817-18 in India, having very briefly sketched out the course of the disease; I may remark that it must not for an instant be supposed that the epidemic was confined in its operations to the towns I have named; these are specified simply as landmarks to enable us to comprehend its general bearings, and as an index to the time when the cholera appeared in certain well-known localities; but we have abundant evidence at our command to prove that, between August 1817 and December 1818, almost the entire people of this densely populated country were subjected to the influence of cholera. It is, nevertheless, remarkable that certain districts, as, for instance, Rohilcund and Bareilly, were exempt from its ravages; the inhabitants also of some more limited localities, as, for

* Graves's *Clinical Medicine*, p. 299.

example, those of Moorshedabad, and the prisoners in the Alipore jail, escaped absolutely free from the epidemic which was raging around them; but these exceptions hardly invalidate the rule, that within a period of sixteen months cholera was generated throughout the length and breadth of Hindostan.

During the early months of the year 1820, cholera was still very prevalent among the inhabitants of Calcutta, especially in April; at the same time the disease broke out among the troops composing the Nerbudda field force. Special indents poured in upon the Board for medicine and native doctors, required on account of the re-appearance of cholera in various localities during the month of May; as, for instance, from Moradabad, Almora, Meerut, Tipperah, Jessore, and Berhampore. From Madras we have similar evidence of reproduced cholera, more or less severe over the whole Presidency, and here and there it was generated with great virulence.* At the close of the year 1820 we hear of the disease at Mhow,† a station north of the Vindhya Mountains, and well to the west of India.

The history of the cholera of 1821 points distinctly to the fact of its becoming more localized in its influence in India than it had been at any period subsequent to 1817; it was generated, however, with considerable activity throughout its endemic area in Lower Bengal, Ganjam, Bombay, and, from time to time, at almost

* *Madras Cholera Report*, p. vii.

† MS. Proceeding of the Bengal Medical Board for the year 1822, vol. II.

every station throughout the Madras Presidency,* but the cases were by no means so numerous or severe as in 1820. The Nerbudda field force again suffered severely from cholera, the disease evidently still retaining much of its former energy in the western part of the peninsula ; for not only do we hear of it at Mhow and along the valley of the Nerbudda, but also in Bombay, where, from the 23rd to the 28th of May, 235 deaths occurred from cholera, and, as usual in this part of India, the disease "increased in severity during August and September."†

From the Proceedings of the Medical Board we learn that the year 1822 was marked by almost absolute rest as regards cholera ; in fact, the great epidemic which had arisen in 1817, well nigh covering India within the three succeeding years, had now subsided.‡ A fair criterion of the comparative death-rates from cholera for the years 1818 and 1822, is supplied by the Returns of the Madras Army. In 1818 this force amounted to 69,416 men, and among these 896 casualties occurred from cholera ; but in 1822, the force having increased to 85,517 men, only 369 deaths are recorded from this disease. In examining these Returns, we are struck with the marked difference which exists between the death-rate from cholera among our European and Native troops in India, amounting to 21 per 1000 of the former, and to 10 per 1000 of the latter.

Throughout the early months of the year 1823 cholera

* *Madras Cholera Report.*

† *Calcutta Journal* for 1821.

‡ *Scott's Madras Report*, p. xiii.

was prevalent in the Presidency, Cuttack, Sylhet, and the Midnapore divisions; Beerbhoom and Balasore suffered during May.* At Dinapore "the greater number of cases appeared upon a sudden change of the weather;" but, with these exceptions, we have no evidence of epidemic cholera in or beyond the Delta of the Ganges. In the Madras Presidency many stations were again entirely free from cholera; † it broke out here and there, as, for instance, in the 34th Regiment, which was encamped at the Mount near Madras, for the purpose of volunteering preparatory to embarkation for England. "In consequence, apparently, of the excessive heat of the tents, and the great drinking attending the volunteering, a high degree of susceptibility to the disease was reproduced among the men, which appeared to be excited into a severe epidemical visitation by a slight change in the weather. At the same time the disease was not prevailing in the fixed troops at the station, nor anywhere in the neighbouring country, except in the 54th Regiment, just arrived in India, and in the 53rd on its march. While the disease was prevailing in the 34th, a party of volunteers left it for the depôt at Poonamalee, eight miles distant. In the course of a week after their arrival there, twenty cases occurred in that party, but not one in the various other parties of troops previously there, though they were all mixed up together. The 53rd Regiment shortly after underwent their volunteering in the same neighbourhood and under the same circumstances with

* Annesly *On the Diseases of India*, p. 249. London, 1825.

† Scott's *Madras Report*.

the 34th—of exposure to heat in camp and intoxication—yet, escaped the disease. The 53rd had but two months before undergone a severe visitation, induced by marching and atmospheric influences, by which its susceptibility was exhausted, and the causes which proved so fatal to us were insufficient to reproduce it in them.”*

In 1824 cholera was only generated to a slight extent beyond its endemic area. It broke out among the European Artillery and men of the 15th Regiment N. I. at Mhow. Concerning this outbreak of cholera, the Superintending Surgeon remarks: “The only troops of this division that have suffered from cholera, were the 15th Native Infantry and European Artillery, which unfortunately passed on their route through the crowded and filthy cities of Indore and Oujein, while the dire disease was raging with great violence; whereas in Mhow, the station they had left, though only twelve miles distant from † Indore, not a single case had occurred.”

In the Jubelpore district there was rather a severe, but short, outbreak of cholera in July; it did not affect the troops.

During the early months of the year 1825, we have a repetition of the old story—Cholera in Calcutta; the pilgrims at Pooree suffering severely, and the government urgently called on to exert themselves in favour of these poor creatures. In April, May, and June, reports were received from various districts in the Delta of the Ganges, as to an increase in the number of

* *Essays on the Epidemic Cholera of India.* By R. Orton.

† MS. Proceeding of the Medical Board.

cholera cases ; from Ganjam and along the eastern seaboard a similar cry was raised, and later in the year from the western side of the peninsula at Mhow. Among the inhabitants of Calcutta and the city of Dacca, cholera was very prevalent again in August and September. Nevertheless, on the whole, India was comparatively free from the disease, as it had been during the two previous years, except in the endemic area of cholera in Lower Bengal, a district which, as I have before demonstrated, had for many years past been affected periodically by this malady.

In the meantime, however, cholera (A.) had not only extended to the west of India, but it had also travelled to the east from Hindostan, the Burmese empire being under its influence in 1819. During the following year the country of Siam was absolutely devastated by cholera ; it appeared about the same time in Malacca, into which place the disease was "said at the time to have been brought by a vessel from the coast ; the fact is undeniable, that the disease broke out shortly after some persons ill with the complaint had been landed from such a vessel." *

Penang and Singapore, islands in the channel, were all simultaneously affected ; but cholera broke out in none of these islands until it had previously ravaged the neighbouring territory with which there was constant intercourse. Bangkok, the capital of Siam, became infected in 1820, coincident with the arrival of British

* *Transactions of Medical and Physical Society*, p. 329. Calcutta, 1842.

vessels from India, which conveyed their goods up the river to the town. At Java the disease appeared on the arrival of trading junks coming from Samarang. At Manilla the malady appeared after the arrival of vessels from infected places. The Malaccas suffered after Dutch vessels coming from Calcutta had touched there. *

M. Huc writes that in China it was under the following circumstances that this malady, *formerly unknown*, made its appearance. "We have the account from a great number of the inhabitants of the province of Chan-tung, who were eye-witnesses of what they relate. It first appeared on the shores of the Yellow Sea, as a mist which gradually rose from the water, winding its course along the hills and valleys; and wherever it passed, men found themselves suddenly attacked with a frightful disease, which was incontestably the cholera.† It ravaged first the province of Chan-tung, then turned northward to Peking, striking in its march the most populous towns; it then crossed the Great Wall. It is probable," continues M. Huc, "that it followed the route of the caravans as far as the Russian station of Khiaktha, and afterwards passing through Siberia, invaded Russia."

Cholera (A.) spread during the year 1819 from the south of India into Ceylon; the two places at which it first appeared on the island were Jaffuapatam and Colombo, both on the coast and in constant communication with the continent. Between these two spots,

* *Quarterly Review*, No. xlv, 1831-32, p. 196.

† *Travels in Tartary, Thibet, and China*, vol. II, p. 24. By M. Huc.

including a range of at least two hundred and fifty miles of territory, we have the authority of Deputy-Inspector Farrell for asserting that no cases of cholera could be found previous to the disease having been communicated to the above-named towns: from these places cholera spread into the interior, and ultimately attacked Candy, the capital of Ceylon; in fact it extended well nigh over the length and breadth of the island.

Before leaving this part of our subject, we have still to consider a very important case which occurred during the period under review: I allude to the outbreak of the epidemic in the Mauritius in the year 1819. The circumstances of the case are briefly as follows, taken from the journal of the surgeon in charge of the vessel: "H.M. Ship 'Topaze' sailed from Trincomalee on the 9th of October 1819, having fifty-seven men on the sick list; and immediately after leaving, cholera broke out and attacked seventeen men, four of whom died.

"On the arrival of the ship at Mauritius, on the 29th of October, thirty-six men were taken on shore and accommodated in the Military Hospital, Port Louis; six of these men died, four from the sequelæ of cholera, with which disease they had been seized on board. Three weeks after the arrival of the ship at Port Louis, the cholera made its appearance among the inhabitants, and continued to carry off from fifty to sixty persons daily, chiefly slaves. It appeared immediately afterwards in other quarters of the island with equal fury."* Not a single case of cholera occurred on board the "Topaze" after her arrival in the Mauritius, although all the merchant vessels in the harbour were losing men by the disease.

Such is the unvarnished tale of the "Topaze," upon the consideration of which Sir Gilbert Blane lays down the law absolutely in favour

* *London Medical Gazette*, vol. IX, p. 226.

of contagion, and with reference to this case exclaims: "Can there be a doubt in the mind of any rational being that this disease, never before known in the Mauritius, was imported by this vessel?" Sir G. Blane carries on the history of the "Topaze" a step farther than the surgeon of the vessel has done; he informs us that the Governor of Bourbon, under the strong conviction that the disease was contagious, took measures, by proclamation, to bar all intercourse with the Isle of France; but in spite of this, a boat from the shore of Bourbon had clandestine communication with a small vessel from the Isle of France—probably about the 8th or 9th of January, for she left Port Louis on the 6th; after the usual interval, the disease showed itself in Bourbon, so as to leave no doubt of an infection traceable to the boat and spreading to one quarter of the town. The governor, with that vigilance and energy which was in his character, instantly adopted such measures of police, by cordons of troops, and by conveying the sick to a lazaretto, that the farther progress of it was arrested, and in a short time it died away. In the Mauritius, on the contrary, the disease spread to the whole town, and to the rural population, to a calamitous degree.*

On the other hand the Commissioners assembled by Major-General Darling, commanding the Island of Mauritius, at Government House, on the 23rd of November 1819, assert that they are "unanimous in not supposing it (the disease) contagious, *or of foreign introduction*. From the disease pervading classes who have nothing in common but the air they breathe, it can be believed that the cause may exist in the atmosphere."†

We may here pause for an instant to consider the

* *Notes on Epidemic Cholera*, p. 256. By R. H. Kennedy. London, 1846. Second Edition.

† *Report of the Committee appointed by His Excellency the Governor of Mauritius to Inquire into, and Report upon, the probable Cause of the Outbreak of Cholera in the Island of Mauritius in March 1856*, p. 143. Port Louis, 1857.

conclusions arrived at by the Bengal Medical Board in 1819 regarding the outbreak of epidemic cholera of 1817-19.

The Board called for reports on the subject from all the medical officers in this Presidency, and the mass of evidence thus obtained was arranged by Mr. Jameson, Secretary to the Board, and published under their supervision. Their report will remain as an honourable memorial of the Bengal Medical Service for many years to come, showing what they were capable of forty years ago ; nevertheless we must admit, to our shame, that this report of 1819 was the first—the last—the only conjoined effort made by the Government of India and the Indian Medical Service to unravel the mystery which from that time up to the present has surrounded this disease.

Mr. Jameson states that the Medical Board had arrived at the conclusion that the proximate cause of the disease consisted in a pestilential virus, which acted primarily upon the stomach and small intestines ; and that the depressed state of the circulatory powers and diminished action of the heart were consequent on the severe shock which the system had received in one of its principal organs ; these effects being always noticed subsequent to the vomiting and purging.

As to the remote causes of the disease, the Board believed that none of the hypotheses put forward accounted for its phenomena, nor did they consider it profitable to speculate farther on the subject.

The notion of cholera depending upon irregularities of the season or upon improper food having been dismissed

as untenable, the Board thought the spread of the disease was connected with the east wind ; but they hesitated to express an opinion as to whether the wind carried the virus from one place to another, or if its action depended upon the moisture which always accompanies this easterly wind. The disposition of the disease to follow the course of large rivers was explained by these being the natural paths of commerce, and therefore in the line of large towns and overcrowded cities. But beyond this they distinctly pointed to the fact that low alluvial soils are the localities in which cholera loves to dwell.

The Board were of opinion that the cholera was not a contagious disease, and if quarantine laws had been found useful, people would naturally have resorted to them. The removal of a camp was often useful, and in fact stayed the spread of the disease, although the sick and baggage moved with the camp ; the change from one locality to another being often sufficient to stop the malady, which would not have been the case had it been contagious.

I shall not make any comment on these views of the Calcutta Medical Board, which, I believe, on the whole faithfully represented the opinion of the majority of professional men in India at the time they were written. There were however a few exceptions to this rule. Dr. Hartley Kennedy, for instance, published an admirable work on cholera (A.) at the close of the epidemic of 1817-23, in which he contends that the disease was clearly communicable from the sick to healthy people. I may, however, remark that, throughout the Peninsula

of India, we have evidence to prove that the cholera, which desolated the country in 1817-18-19, gradually died away. In the same way the disease absolutely disappeared from Persia, Ceylon, Burmah, and China, after existing in these localities for three or four successive seasons—in fact, the epidemic cholera which had extended from India over these countries had again entirely subsided into its endemic area in Lower Bengal—the Home of Cholera, as Dr. Macpherson calls it.

CHAPTER IV.

THE EPIDEMIC OF INDO-EUROPEAN CHOLERA OF 1826-34.

I HAVE shown in the preceding chapter that the epidemic cholera of 1817-23 gradually disappeared from the countries over which it had spread; and in Bengal we hear but little of the disease throughout the years 1823-24-25, except in its endemic area; but the history of the Asiatic cholera during the twelve months following this period is of special interest; and I am almost entirely indebted for the information I have gained regarding it to the reports and returns contained in the Proceedings of the Medical Board. From these we shall find that the great epidemic, which spread over Europe and extended to America in 1830-31-32, arose in Bengal in 1826.

The cholera of 1830-31 is usually described as having originated in Astrakhan; for instance, in Dr. Baly and Sir W. Gull's report we are informed that

"in 1823 cholera passed the Caspian Sea, and in the month of September showed itself in Astrakhan. It made no further progress, however, in Europe until the year 1830. In that year, having appeared again at Astrakhan in June and July, it extended rapidly

through the eastern part of Europe." * M. Sawas, a member of the Cholera Conference assembled at Constantinople in 1866, thus describes the origin of the European cholera of 1830-31: "In 1829 it broke out at Orenburg, which maintained extensive commercial transactions with Bokhara. From Orenburg it passed to Kiakhtha, a town on the frontier of the Russian empire, and the seat of a great fair. From Kiakhtha the disease was communicated to Cabul in 1829, after the fair, and thence it passed progressively to Herat and Mushed, and broke out in the following year in Teheran."† Dr. Arkhangelsky in his recently published work on cholera remarks that from 1824 to 1829 there was no cholera in India beyond the province of Bengal, but that in 1827 the disease manifested itself in Cabul, and in the following year at Kiva.

These accounts of the disease give us a most imperfect idea of the origin and course of the outburst of epidemic cholera, upon the study of which we must now enter.

During the first quarter of 1826 cholera was evidently on the increase throughout the whole of Lower Bengal. Among the troops in the Presidency Circle no less than 76 cases occurred in April; of these 38 died. But what is of more importance to notice is, that H.M.'s 31st Regiment at Dinapore was attacked by cholera in April 1826, 57 men having been seized with the disease; of these 23 died: and, at the same time, in the regiment at Buxar, 49 men were affected with cholera, and 29 died. From Dinapore, Dr. Dickson writes on the 4th of April

* *Reports on Epidemic Cholera*, drawn up at the desire of the Cholera Committee of the College of Physicians, p. 118. By Drs. W. Baly and W. Gull. London, 1854.

† *Proceedings of the International Conference at Constantinople*, 1866, pp. 313 and 459. Calcutta, 1868.

1826 : "I am very sorry to report that cholera has again commenced its ravages at this station. The surrounding districts are likewise most severely affected." * The Superintending Surgeon at Benares, on the 13th of May 1826, reports "that, in the city of Benares, two or three hundred persons were daily carried off by cholera, and yet the troops, and prisoners in the jail, remained entirely exempt from the disease, which, nevertheless, was most severe all over the Benares division." In the Cawnpore Circle, during the month of June, 64 European and 108 native soldiers were attacked by the disease. We have clear evidence, therefore, of a severe outburst of epidemic cholera, commencing early in 1826, throughout the whole of Lower Bengal, and gradually extending towards the north-west as far as the Cawnpore division during the first six months of the year. Before August cholera had subsided, but by no means disappeared from Cawnpore eastward.

In November 1826 we notice the first muttering of the storm which was gathering in the west. The Superintending Surgeon of the Nusseerabad division writes as follows : "In the stations on the right bank of the Jumna—viz., Delhi, Muttra, and Agra—the returns show that the corps there have experienced during the month a slight invasion of cholera." And Dr. H. Kennedy writes that, "in April and May of this year (1826), the epidemic raged with more of a pestilential character than I had as yet observed at Baroda. It seems to have

* See also Dempster's account of this epidemic in the *Transactions of the Medical and Physical Society of Calcutta*, vol. III, p. 420.

been prevalent throughout Guzeratte at the same time ; and the destruction of life, if the grand total could be collected, would no doubt present a most distressing subject for our reflection." *

The above details are sufficient to give us an idea of the cholera of 1826 ; its steady advance from east to north-west along the course of the River Ganges and Jumna, as described by the Marquis of Hastings in 1817 ; and of its halting in its development in November as the cold seasons set in.

I would draw special attention to the foregoing observation of the Superintending Surgeon of the Nussereabad Division, as to the invasion of certain cities by cholera on the right bank of the Jumna towards the close of the year 1826. We have no accounts as to the progress of the disease among the surrounding native population ; for the Government of India seemed to think it was useless to call for further reports on the subject, until the doctors had made up their minds as to whether the malady was a contagious one, a point which so far as India is concerned they have not settled up to the present moment, and cholera (A.) is as rampant there now as it was during the times we are describing.

Sir J. R. Martin remarks :† "I served in the General Hospital, Calcutta, in March 1827, the time referred to by Mr. Twining, when the house was filled with cholera patients, and when all of us, Europeans and natives,

* Hartley Kennedy *On Epidemic Cholera*, p. 31. London, 1846.

† *The Influence of Tropical Climates on the European Constitution*, p. 298. By J. R. Martin. A New Edition, 1856.

were exhausted with the labours of attending on the sick, but none of us suffered from the disease," Maulmain, Arracan, Chittagong, and the whole Delta of the Ganges were, during the first quarter of the year, under the influence of a severe outburst of cholera.

In May 1827 Dr. Taylor wrote to the Board from Agra, reporting that cholera "has prevailed, in an epidemic form, in all the villages within several miles around Agra; an immense number have fallen victims to its destructive influence." Dr. Skipton, from the same place, remarks that twenty-three cases of cholera occurred among the men of the 58th Regiment N. I., and only two from the lines of the Regiments on either side of the 58th. Dr. Knight at the same time sent information to the Medical Board of the outbreak of cholera at Bareilly. From Meerut, Dr. Ludlow writes: "During the melancholy visitation of cholera the convicts suffered comparatively little"; "of the stations depending on Meerut after Rajpooorah, cholera has chiefly been felt at Dhyra in the Dhoon and Moradabad; since the 6th instant we have had easterly winds, but as yet no regular fall of rain." From Delhi, Dr. Longstaff reports: "During the greater part of June cholera morbus has raged amongst the inhabitants of the surrounding towns and villages to an epidemic extent, but among the European troops only two cases have occurred, and not one among the Horse Artillery."

As early as May cholera had been generated at Nusseerabad; "the disease, in many instances, on its first appearance assumed a character of great malignity, and

the powers of life were almost exhausted with the commencement of the attack." It was very severe throughout the provinces of Ajmere and Jeypore, but the inhabitants of Oudepore escaped. Dr. Govan informs us that, on the Himalaya at Nahin, some 3,027 feet above the level of the sea, cholera broke out in a virulent form on the 4th of June 1827, and that it "raged at Sabathoo from the 18th June to the beginning of July." *

Epidemic cholera existed at Hurdwar† and throughout the Punjab during the year 1827. ‡

The disease was reproduced in Cawnpore, Allahabad, and other districts which had been invaded by it during the previous year, although in a less severe form. The Central Provinces seem, however, to have escaped the cholera of 1826-27.

The general features of the epidemic I have now described appear to be somewhat as follows: we notice a vast increase of the disease in its endemic area, and during the first half of the year its progressive extension towards the north-west, followed by a gradual subsidence of the malady. During the second half of the year, cases of the disease occurred beyond the previously affected area, and in the same line of country.

Throughout the following twelve months cholera was reproduced over the districts which had been affected

* MS. Proceedings of the Bengal Medical Board.

† *Sanitary Report on the Hurdwar Fair of 1867.* By Mr. H. C. Cutcliffe.

‡ *Localities in India exempt from Cholera*, p. 78. By Dr. Balfour.

during the previous year, and an outburst of the disease occurred over an enormous tract of country beyond that which had been invaded the year before, the epidemic still spreading to the west and north-west.

Supposing the cholera had continued to advance to the north-west at about the same rate and by the same route, throughout the year 1828, as it had done during the two previous years, we should have expected to meet with it in 1829 to the north and south of the Caspian Sea, in the district of Russian Orenburg, at Herat, and Teheran. A glance at the maps of Europe and Asia will best elucidate this point. It is true we know but little of the epidemic as invading the countries between the Punjab, Russia, and Persia, and, from their wild and inaccessible nature, it was at the time impossible for us to receive much information regarding them; nevertheless, we have actual proof that the cholera of 1829 did extend across a part of Afghanistan and Persia; for, in the *Government Gazette*, published in Calcutta, 14th January 1830, I find the following communication: "We regret to state that the greatest consternation prevails at Teheran in consequence of the appearance of the cholera morbus, which has gradually advanced from Herat, through Khorasan, to the Persian capital. At the former city, King Mahomed and the Prince Koursan, the last members of the Suddœ Zya Royal Family in Afghanistan, who have enjoyed any authority or importance, have fallen victims to the epidemic. His Majesty the Shah has left Teheran and retired to the mountains in the vicinity. The

princes and nobles were following his example, and even the lower orders of the people were dispersing, in order, if possible, to escape the pestilence." Lieutenant Conolly also remarks that the "year before our coming to Herat (*i. e.*, in 1829) the cholera had swept away many thousands of persons from the city and the provinces around."* Further than this, we hear of cholera having prevailed in 1829 "in the province of Khorasan, and likewise in various districts of Bokhara, above all in Chiva (Khiva), a city of the province of Turkestan."†

I have already mentioned that cholera (A.) was very severely felt in parts of the Bombay Presidency during the year 1826; and in the month of November of the following year we again hear of cholera in Arabia. Said-bin-Sultan had landed with his forces to attack the town of Munamah (Bahrein); but having met with some reverses, "and in consequence of the ravages committed among his followers by the cholera morbus," he retired.‡

If we compare together the phenomena of the three epidemics we have been considering, we can hardly fail to notice the analogy they present. In the outline I have given of the first, that of 1781-83, we find an increase of cholera over its endemic area, and its advance to the north, followed by an outbreak of the disease at Hurdwar

* *Journey to the North of India, Overland, from England through Russia, Persia, and Afghanistan*, vol. II, p. 5. By Lieutenant Conolly. London, 1838.

† *The Edinburgh Medical and Surgical Journal*, vol. XXXVI, p. 126.

‡ *Bombay Government Selections*, No. xxiv, pp. 196-67.

during the succeeding year, "after a heavy fall of rain followed by an easterly wind."* In the second epidemic (1817-21), cholera raged over its entire endemic area, and spread during the same year towards the north-west as far as Cawnpore. The following year it extended its deadly influence over the Western and North-Western Provinces and Punjab before July, re-appearing in many of the localities it had affected earlier in the year, in the months of August, September, and November;† it subsequently appeared in Persia. In the third epidemic we have traced a precisely similar progress; and I would draw special attention to the fact, that not only did the invading cholera pursue the same course as it followed in 1818, but was also heard of at Hurdwar in April, and throughout the North-Western Provinces, and along the

* MS. Proceedings of Medical Board.

† No. of cases of cholera :—

	In the European Army in Bengal.					Native Army.	
1826	.	.	.	592	.	.	475
1827	.	.	.	625	.	.	933
1828	.	.	.	729	.	.	350
1829	.	.	.	664	.	.	322
1830	.	.	.	287	.	.	237
1831	.	.	.	366	.	.	283
1832	.	.	.	161	.	.	265

In the General Hospital, Calcutta, the admission of cholera cases were :—

1827	.	.	.	.	.	.	812
1828	.	.	.	.	.	.	692
1829	.	.	.	.	.	.	632
1830	.	.	.	.	.	.	277

Himalayas, before the middle of June. From the evidence however, which I have already adduced, I trust I have made it clear that the Bombay Presidency, Sind³, and the Punjab, were under the influence of cholera which had extended from the east, during the year 1827, and had reached Khiva and Herat *via* Cabul in 1829. I shall now endeavour to trace the continuation of this epidemic from India, through Europe, to America.

On the 26th of August 1829 the disease broke out in the city of Orenburg; it was not, however, until the "10th of September that its true nature occurred to the physicians of the place."* Between the 9th and 25th of the month, 57 cases had been reported, and before the 21st of October, 747 people were attacked by the disease. By the 20th of November the epidemic had entirely disappeared from the city, into which, in the first instance, it was said to have been imported by caravans from Bokhara.† Lichhustadt, however, writing of this epidemic in 1830, remarks, that "the Kirghis by their own account supply clear, convincing proof that cholera had shown itself in some of their hordes on the Tlek and Emba (the former of which streams joins the Aral from the S.W., a little below Orenburg). Nevertheless, it has not been demonstrated that cholera was actually thus introduced from the east.‡ And it will probably never be determined

* *The Edinburgh Medical and Surgical Journal*, vol. XXXVI, p. 122.

† *Proceedings of International Sanitary Conference at Constantinople*, 1866, p. 395. Calcutta.

‡ *The Edinburgh Medical and Surgical Journal*, vol. XXXVI, p. 126.

exactly whether cholera reached Orenburg in 1830 by means of caravans coming from Bokhara or Khiva, or if it spread through the wandering tribes of Kirghis; but we are certain of one fact, and that is, that the disease existed in Bokhara in 1829, and also at Khiva, and that these places had very considerable mercantile transactions with Orenburg, a frontier town of Russia, and a great mart for Asiatic produce, and this was the first place in Europe attacked by Asiatic cholera. I have no means of forming an exact opinion of the amount of trade carried on between Russia and the east through Orenburg during the year 1829; but three years subsequent to this date Mr. M'Gregor, the secretary to the Board of Trade, remarks that the "trade of Russia with Khiva and Bokhara appears to be growing into importance, chiefly from Nijnei-Novogorod, and through the town of Orenburg, on the river Aral. This town is admirably situated for trade with the Kirghises, and with Khiva and Bokhara; although a part of the Russian trade with the countries east of the Caspian is carried on from Astrakhan across that sea, and to some extent through Persia. Orenburg, which has a population estimated at nineteen thousand inhabitants, is situated on the north bank of the Aral. This long tortuous river, with the mountain range of the same name, forms a boundary between European Russia and Asia. It is shallow, and of little advantage for navigable purposes, but it abounds with fish. The town of Orenburg is regularly built and fortified. The trade of the town is chiefly carried on at bazaars, on the south or Asiatic side of the river.

"In 1833 there arrived, according to Schnitzler, fourteen caravans of 2,547 camels, exclusive of horses; and thirteen caravans of 4,769 camels, and 264 horses departed, laden with goods, for various parts of Asia, chiefly for the country of the Kirghises, for Khiva, and for Bokhara." *

About the 23rd of September cases of cholera began to appear in various parts of the Orenburg Government; and the first place in which it was known to exist was in the fortress of Rasūsna, sixty miles west of Orenburg; and, between the 3rd and 4th of October, it appeared in various villages and forts to the west and south-west of the district. The disease extended about 200 miles to the north and north-west of Orenburg, and about sixty miles to the westward; this space it traversed between the 26th of August and the 6th of February, but the greater part of it was visited by cholera before the middle of November. On the 23rd of February the disease had well nigh disappeared, though it still cropped out here and there, being generated, for instance, at a few advanced posts beyond the sanitary cordon round the infected localities.

We must here pause for an instant, to notice the progress of the epidemic from India directly westward into Persia. I have already quoted a passage from the *Government Gazette* as to the advance of cholera from Herat to Teheran in 1829. As this notice was derived from Russian sources, and had, therefore, to travel from Persia to Petersburg, and thence to Calcutta *via* London, in days when steamers were unknown, we may safely

* *Commercial Statistics*, vol. II, p. 637.

conclude that the events recorded in the *Calcutta Gazette* of January 1830, had happened at least four months previously ; consequently we may assume cholera to have existed at Teheran during the time of its outbreak in Orenburg in the autumn of 1829.* It would appear, also, that the disease had subsided in Persia throughout the winter of 1829-30, for Sir W. Crichton informs us that, *in the spring of 1830*, the cholera broke out in the province of Khorasan, and appeared at Tabreez, and in the seaport towns of Reshd and Bakou on the Caspian. In July it was generated at Tiflis ;† it soon after appeared in Astrakhan, and here “the stream of cholera, which entered Russia from the northern provinces of Persia, formed a junction with that which flowed through Orenburg.”‡ In fact, the time for the reproduction and advance of cholera had come round, and as surely do we find it progressing again from east to west, and north-west. The base from which the invading cholera of 1830 extended occupied an imaginary line drawn through Teheran and the western boundary of the province of Orenburg. On the 4th of August, we hear of cholera at Tzaritzin and Saratov, where it raged with great violence, no less than 2,367 of its inhabitants having been carried off by the disease. Towards the end of the month it was at Nijnh Novgorod,§ so that up to the end of August

* *Proceedings of International Sanitary Conference at Constantinople*, 1866, p. 459. *Calcutta*, 1868.

† *Edinburgh Medical and Surgical Journal*, vol. XXXVI, p. 137.

‡ *Clinical Lectures on the Practice of Medicine*, p. 300. By Dr. Graves.

§ *Idem*.

1830, the epidemic had advanced to a line corresponding to about 45° E. long. Westward of this we hear of cholera on the 17th of September at Kharkov, in the south of Russia, and at Moscow in its centre; at the same time it was generated in the Government of Novgorod, the highest point northward which it touched in 1830.* To the south, it extended farther to the west into Bulgaria and the western provinces of Russia.

Throughout the winter of 1830-31 there was a decided lull in the progress of the disease, although cases of cholera were constantly heard of over the area it had invaded during the close of the year, especially in the Russian army of Poland; among these troops the disease was very prevalent during the winter. A few cases occurred at Vienna, about the 20th of November.

True to its character, we find the cholera of 1830 in full force again in the spring of 1831. It first manifested its renewed power in the provinces of Volhynia, Grodno, and Vilna, and was at Warsaw on the 14th of April. It soon afterwards broke out at Riga. It was very virulent among the Russian troops in Poland. The war going on between these powers has, in fact, been considered, by eminent authorities, as having been "the great cause of the rapid propagation of cholera in Europe."†

It will be remembered that cholera existed in an epidemic form in November 1828 in Arabia; and, in

* *Report on Epidemic Cholera*, p. 122. By Drs. W. Baly and W. Gull.

† *International Sanitary Conference of Constantinople*, p. 113. Calcutta, 1868.

1831, Lieutenant Wellsted, who was engaged at the time in making a survey of the Red Sea, informs us that the disease had been generated with fearful virulence among the pilgrims assembled in Mecca.* It showed itself in some few cases previous to the hajj, and was supposed by the Arabs to have been brought by pilgrims from India; but it was not until the whole multitude had assembled that it reached its height. Its virulence became at length so great, that it is computed nearly one half the pilgrims fell victims to it. The governors of Mecca and Jeddah, the Pasha who accompanied the Syrian caravan, and many other people of distinction, were swept off. So numerous were its victims that the living ceased to bury the dead singly. The disease followed the pilgrims in their passage up the coast, attacking the inhabitants of Jembo, Suez, and Cairo, in succession.† It reached Alexandria by the 2nd of August, but before this period had invaded Asia Minor‡ and Egypt.§ Cholera made its appearance at Constantinople in July, and again in Bulgaria; by the middle of July it had reached Pesth, and covered the whole of Galicia. About the same time the epidemic was at Cracow, and, as we have already noticed, earlier in the year at Warsaw and Riga. Nor was this by any means its most northerly point of attack during the summer of

* *Report on Epidemic Cholera*, p. 122. By Drs. W. Baly and W. Gull. Official Reports made to Government by Drs. Russel and Barry, *On Cholera*, p. 66. London, 1832.

† Wellsted's *Travels in Arabia*, p. 254. London, 1838.

‡ *The London Medical Gazette*, vol. IX, p. 756.

§ Dr. Graves' *Clinical Lectures*, p. 302.

1831, for we find it at Archangel in May. In the beginning of August it was at Helsingford; after this Aland and the neighbouring islands were affected, and so it passed into Sweden. *

In St. Petersburg the first case of cholera occurred in June; the wind, from the 1st of June to the 31st of August, having blown 51 days from the east, 32 westerly, and 9 days variable. Every available means were employed effectually to surround the city by a sanitary cordon, the whole power of the emperor being exerted to prevent infected persons from entering the capital, but without the slightest effect: at its appointed time the disease was generated throughout the city, and continued its work of destruction during the months of July and August.

The cholera still continued its undeviating course westward. On the 3rd of August it had reached Berlin and Vienna; on the 15th of the month "Bohemia was widely affected; but the disease did not spread from Vienna far to the south or west, and accordingly Carinthia and the Tyrol escaped, all being protected by strict precautionary measures. It is worthy of notice that cholera remained, as it were, stationary, and in a suppressed form, during the winter of 1831-32, in Hungary, Bohemia, and Germany. It did not spread to Saxony, Mecklenburg, Bavaria, and scarcely into Hanover, although these bordered on infected states,—an immunity not to be accounted for by the existence of any natural boundaries, as mountains or rivers, for

* Official Reports *On Cholera*, p. 107. By Drs. Russel and Barry.

the limits are mostly conventional between the infected principalities and those that escaped; many have, therefore, attributed their escape to the precautionary measures taken." * In this passage Dr. Graves has given us a concise account of the circumstances of the invading cholera of 1831-32, which, with a remarkable consistency of character, progressed from east to west for a certain time, and then declined for a season to advance any farther, precisely as it had done at Cawnpore in 1826-27, in the Punjab in 1827-28, probably in Afghanistan in 1828-29, and certainly in Orenburg and the south of Persia in 1829-30, to the west of Russia in 1830-31, and so now to the west of Germany in 1831-32.

Dr. Peters of New York has referred us to the existence of cholera in England during the summer and autumn of 1831, the cases having been reported by Dr. J. Hall, R.N., who had seen the disease in India. The outbreak occurred on board the ships of war lying in the river below London, "in a creek of the Medway, where ships from infected parts performed quarantine. In the month of June 1831, numerous vessels arrived from Riga, where cholera was raging." Early in July two cases occurred on board the English men-of-war. It became epidemic on board various ships. Sometimes whole families were involved; in others several members in succession. From the 7th to the 9th of August, 30 deaths occurred from the disease, and 120 more during October. No similar disease had been noticed in the Medway before. No case occurred on board

* Graves' *Clinical Lectures*, p. 302.

the ships of war until full three weeks after the merchant vessels from Riga had arrived in the river, and had been put in quarantine.*

About the end of October cholera appeared at Sunderland,† and was supposed to have been imported from Hamburgh. "The persons first attacked in the port resided on the quay, and were exposed to intercourse with the shipping. No communication, however, was satisfactorily traced between these persons and the particular ships referred to, nor were any of these ships known to have persons sick with cholera on board."‡ The inhabitants of the populous village of Deptford, close to the Ayres quay, "where the disease was very prevalent and fatal," escaped its influence; as did the agricultural villages in the immediate neighbourhood of Sunderland.§ It was subsequently stated that cases of cholera had in reality occurred in Sunderland as far back as the 5th, 14th, and 27th of August—two months before the declared importation of the disease.|| And it is most probable such was the case; but we have no evidence of the existence of Asiatic cholera in the place before October. Cholera (A.) subsequently appeared at Newcastle,

* *Edinburgh Medical and Surgical Journal*, vol. XXXVII, 1832, p. 295.

† *Observations on the Pestilential Cholera*, p. 19. By W. Ainsworth, Esq. London, 1832.

‡ Drs. Baly and Gull's *Reports on Cholera*, p. 21. *Cholera as it recently appeared at Newcastle and Gateshead*, p. 104. By T. M. Greenhow.

§ *Cyclopædia of Practical Medicine*, vol. I, p. 400. Edited by Drs. J. Forbes, Tweedie, and Conolly. London, 1833.

|| *Quarantine*, p. 30. By Gavin Milroy, M.D. London, 1847.

Gateshead, Edinburgh, and in London in February. The number of deaths in England amounted to 97 in November, 282 in December, January 614, February 708, March 1,519, April 1,401.*

The cholera of 1831 having failed to spread beyond Germany, France remained absolutely free from the epidemic until the following year. On the 24th of March, however, cholera burst out in the very centre of the country at Paris. According to M. Gendrin, on the third day of the appearance of the disease, he received patients from every district of Paris into the Hôtel Dieu. He observes that the patients' distant residences, and opposite professions, preclude the probability of their having derived their disease from human contact. Of the first ninety-eight cases admitted into the hospital, no less than ninety-six died.† Within a week the mortality reached 500 per diem, and the cases to four times that amount; in eighteen days no less than 7,000 persons had died of cholera in Paris. M. Meurthe observes that the Luxembourg quarter contained about 20,000 inhabitants, and of these 7,532 were indigent people, and 13,330 of the better classes. Among the former, no less than 4,500 suffered from cholera, and only 2,500 of the latter.‡ The village of Issy, situated on the road from Paris to Versailles, totally escaped, although surrounded by other

* *Report on the Mortality from Cholera in England, 1848-49.* By Mr. W. Farr.

† *Monographie du Choléra Morbus Epidémique de Paris.* Par A. M. Gendrin. Paris, 1832.

‡ *Histoire du Choléra Morbus dans le quartier Luxembourg.* Par M. H. Boulay de la Meurthe. Paris, 1832.

hamlets—Vanores, Vangirara, Beau, Grenelle, which were all cruelly ravaged by the disease.

At the time of the advent of the epidemic in France it was also generated in Ireland, and spread over many of the principal towns in that island. The disease was reproduced in England, and before the end of August had visited Hull, York, Leeds, and several other large towns ; the total number of cases in England, however, amounted only to 14,796, and of these 5,432 died.

Want of space will not allow of my entering upon a detailed account of the phenomena presented by the disease in our own country ; the best description of it is to be found in the *Cholera Gazette*, published by authority, from documents communicated to the Central Board of Health. Some of the cases are very remarkable ; for instance, Dr. J. Douglas describes the appearance of the disease in Hawick, where cholera was absolutely unknown until the 15th of January. On the 10th and 11th a man named H. Halliburton had put up at an inn in Morpeth ; on the latter day a commercial traveller arrived at the same inn, was at once seized with cholera, and died. Halliburton returned home to Hawick ; on the 14th he was seized with cholera ; on the 16th his son and brother, living in the same house, were attacked with it. These cases were followed by a number of others, all having had direct or indirect communication with one another.

Dr. Anderson gives us a detailed account of the advent and progress of the affection in Limehouse, in which the communicability of the disease is equally well traced. I

shall have to refer to some of the papers contained in the *Cholera Gazette* at a future period ; they are all the more valuable to us, because written at the time of the epidemic, and by persons watching the cases they describe.

Asiatic cholera had never been met with in America up to this time. That mighty continent contains people living under every variety of climate, and of varying social circumstances ; none of these, however, had developed cholera (A.) among her people. But the progress of the invading disease from east to west was not now destined to be limited by the Atlantic. On the 8th of June 1832, cholera broke out among the inhabitants of the city of Quebec, and on the 10th at Montreal, under the following circumstances : "The brig 'Carricks' sailed from Dublin, then affected with cholera, in April 1832, with 173 emigrants on board. The disease appeared among the passengers a few days after leaving port, and forty-two persons died of it before the 3rd of June, when she arrived at Quebec. The remainder were permitted to land on Grosse Isle, a few miles from Quebec, and no rigid measures were taken to prevent intercourse between them and the city. Several cases of cholera appeared in Quebec on the 6th, 7th, and 8th of June, and on the 9th, fifteen cases were reported officially. This was the beginning of cholera in America."* But, as Dr. Ely M'Clellan has explained, the "Carricks" was only one of several vessels that came to Grosse Isle with cholera patients on board at this time ; in fact large numbers of

* *Asiatic Cholera*, p. 25. By Dr. Burrall. New York, 1866.

emigrants from cholera infected quarters arrived upon the St. Lawrence, and from thence were distributed throughout the province :* for instance, in Drs. C. Peters and Ely McClellan's report, the following details are given : "On the 7th of June the steamer 'Voyageur,' of Montreal, left the quarantine station with a large number of emigrants for the city of Montreal. She touched at Quebec, and then proceeded on her voyage ; but after making a few miles, was obliged, on account of a violent storm and overcrowded condition, to return to Quebec, where she landed a portion of her passengers, and then proceeded on her trip. The disembarked passengers, wet and exhausted, took refuge at emigrant lodging-houses, and quite a number went to the house of a man named Roache, on Champlin Street. At an early hour of the 8th a case of cholera occurred at this house in the person of one of the emigrants landed from the 'Voyageur.' On the afternoon of the 9th a second case occurred in an emigrant from the same boat, who had obtained employment on the same wharf, and the same evening six other cases occurred at Roache's house. By 3 o'clock P.M. the next day fifteen cases had occurred, with fourteen deaths. From these cases the disease spread in Quebec, and during the first two weeks one thousand deaths are reported, fifty-six of which occurred at Roache's house.† On the 23rd of the month the disease appeared in New York, and on the 5th of July in Philadelphia ; it spread over the whole of the

* *Cholera Epidemic of 1873 in the United States*, p. 563.

† *Idem*, p. 564.

United States before the end of the year. The epidemic continued its original course, attacking the towns and villages along the banks of the St. Lawrence, then following the borders of Lake Ontario, until it entered Lake Erie, visiting Detroit and Amertsbergh on the 6th of July.

It will be observed that as yet we have heard little or nothing of cholera in Spain or Portugal. These countries appear to have escaped the influence of the epidemic until 1833. The disease was said at the time to have been imported into Portugal. "The 'London' merchant steamer sailed from England to Oporto on the 25th of December 1832, and arrived at the mouth of the Douro on the 1st of January 1833, having lost seven men on the passage by cholera. The troops which she took out with General Solignac landed immediately at Foz, about ten miles west of Oporto."* Cholera appeared at Foz and in Oporto before the 15th of January, and spread to Coimbra and Gallicia.

In Spain quarantine was most rigorously enforced. Every traveller from an infected district was subjected to the performance of quarantine; and if he entered Spain without having gone through the formality, he was liable to be punished with death, his apparel burnt, and goods seized, the same punishment being extended to those who received him.† In spite of all these precautions, cholera raged with great violence in many

* *London Medical Gazette*, vol. XII, p. 123.

† *Idem*, vol. XII, p. 60.

of the provinces of Spain during the summer of 1833 * and 1834.

The disease broke out on the 26th of February 1833 in Havannah, and continued till the 20th of April. During this period no less than 8,253 persons were destroyed in a population of 65,000 souls.† Later in the year the epidemic was generated with frightful virulence in Mexico; before August no less than 15,000 individuals are said to have perished from it.‡

Throughout the year 1833 we hear of cholera being reproduced over almost the entire area through which we have traced it during the preceding years. Cases occurred in the majority of the large towns of Europe and America. Nevertheless, as a general rule, the disease was far less deadly, and very much more under the control of medicine, than during its period of invasion.

In 1834 the disease had well-nigh disappeared from Europe, and men's minds began to be at ease on the subject. But on the 4th of April 1835, the following passage occurs in the *Lancet*: "We regret to say cholera has prevailed for some time back, if not extensively, yet with great violence in some parts of the south of France; particularly at Marseilles and Toulon." Towards the end of June it was at Villafranca, and a few days afterwards it appeared at Nice and Cannes. On the 12th of August cholera was generated at Turin, and during the

* *Lancet*, October 5th, 1833.

† *Idem*, for 1833-35, p. 325.

‡ *Idem*, p. 596.

same month at Genoa. It extended along the coast of Genoa, as far as Livorno, and in November broke out at Venice, Trieste, and throughout the north of Italy.* The disease then subsided in these parts, until the spring of the following year, when it was reproduced over the whole of Italy. It was very severe at Milan in April 1836, and also along the Dalmatian coast. In October it appeared at Naples, in spite of quarantine and all the precautions usually adopted in the plague; physicians traversed the streets covered from head to foot with black sacks of waxcloth, into which two pieces of glass were inserted to admit light.† The epidemic appeared in Ancona and the island of Sicily. In Rome, of 9,372 persons attacked by cholera, 519 died.‡

On the 9th of June 1837 cholera was generated among the inhabitants of Valetta, first occurring in a house overlooking the quarantine harbour. The deaths among the civil population of Malta between June and October, when the disease ceased, were 3,893; among the garrison (including women and children) averaging 3,070, the cases were 315 and the deaths 78. The Mediterranean fleet suffered considerably, the first cases occurring in June. In the official report of the health of the navy, it is stated that no instance of the disease occurred in any ship as long as she continued in the open sea, or even in the

* *Encyclographie des Sciences Médicales*, tom. XIII, p. 20.

† *Correspondence regarding Quarantine and Disinfection*. (Letter from Dr. F. Mouat, P. J. Government of Bengal, 15th October 1867.)

‡ *The Lancet*, 21st April, 1838.

channel of Malta, unless she had previously communicated either with that island or with Palermo, while it was prevalent in these places.* Malta had been kept strictly under quarantine both before and after the outbreak of cholera. The disease spread, however, to the island of Gozo about a month after it appeared in Valetta.

Palestine was under the influence of cholera in 1837,† and so also was the African shore of the Mediterranean. On the 14th of October the disease appeared at Algiers; in Bona, where the epidemic had prevailed for some time, the number of cases on the 17th of October amounted to 328.‡

Dr. J. Christie, of Zanzibar, remarks that the first epidemic of cholera in East Africa to which any definite date can be fixed, occurred in December 1836-37, during the north-east monsoon, and its line of progress was in the direction of the prevailing wind. It was first heard of at the Somatic ports, and gradually extended southwards in the trade line, till it reached the island of Zanzibar, and from thence it passed farther south, but its limits in that direction are unknown. Arabs who have a distinct recollection of this epidemic, all agree regarding its line of progress; and although the mortality was trifling as compared with succeeding epidemics, it was sufficient to impress the memory, and to fix the date. In speaking of this epidemic, they generally say that it only lasted a few weeks, that the deaths were among the slaves only, and that but few Arabs died, the epidemic being regarded as mild, only in so far as it effected themselves. In Zanzibar, there are many natives of India who recollect this epidemic; they speak of it not only as coming from

* *The Infectious Origin and Propagation of Cholera*, p. 46. By Dr. A. Bryson, R.N. Also *Cholera at Malta*, p. 51. By Dr. S. Watson. London, 1848.

† *Brit. and For. Med.-Chir. Review*, January 1868, p. 186.

‡ *Lancet*, 18th November 1837.

the north, but as being of African origin, and make a distinction between African and Indian cholera; but this distinction arose probably from the fact that while in India their race suffered severely from cholera epidemics, they in Zanzibar were almost entirely unaffected by this and succeeding epidemics; so that, while warning them regarding the danger to which they were exposed while the epidemic was progressing towards the island, they spoke lightly of it, and said that it was only African cholera.*

But it is remarkable that the outbreak of the disease occurred in the Somali country, having direct communication with India and more particularly the Malabar coast, where cholera had been frightfully severe in 1833-34, and that it extended in Africa precisely as it was doing in parts of Europe during the year 1836.

Outbursts of cholera occurred during the year at various places in Italy, Marseilles, Berlin, Prague, and in England at Coventry, and on board the "Dreadnought." With regard to this latter instance, Dr. G. Budd remarks, that there was no trace of infection from foreign parts, or evidence that the disease was propagated from one patient to another. In the "Iphigenia," moored under the stern of the "Dreadnought," there was not a case of cholera, nor did it spread to Greenwich.†

With reference to cholera (A.) in various parts of Europe during the years 1835-37, the question has often been raised as to whether the disease was to be considered as a continuation of the epidemic of 1831-33, or

* "Note on the Cholera Epidemics in East Africa," by James Christie, *Lancet*, vol. I, 1871.

† *The Lancet*, December 23 1837.

did it arise from a fresh importation of cholera from India, which was unable to extend itself very largely, because those people who were predisposed to its influence had so recently been swept off the face of the earth, that there was no soil, as it were, upon which the cholera could reproduce itself in Europe. Dr. Tholozan* argues, with much force, that the cholera (A.) of 1836-37 was a continuation of the epidemic of the previous years; but having carefully studied his facts, in conjunction with those of authorities who wrote on the subject at, and immediately after the epidemic of 1831-33, I am strongly disposed to think that the epidemic of Europe and Africa of 1835-37 spread from India, being a part of the terrible epidemic cholera which extended over the Madras and Bombay presidencies in 1832-34, and from which the cholera of the Hadjiz of 1835 was derived, and probably that described by Dr. Jas. Christie in Africa. But however this may be, as Dr. Arkhangel'sky remarks, it is quite certain that Europe was absolutely free of Asiatic cholera from 1839 to 1846.†

• Having thus attempted to delineate the progress of the epidemic cholera which broke out in Bengal in 1826, and spread from that province over the greater part of Europe and America, destroying in its advance millions of the human race,‡ we may, before dismissing

* *Durée du Choléra Asiatique en Europe et en Amérique.* Paris, 1872. Par T. D. Tholozan.

† *Cholera Epidemics of European Russia*, p. 136. By Dr. Arkhangel'sky, St. Petersburg. 1874.

‡ *Quarterly Review*, vol. XLVI, 1831, p. 170.

this period in the history of cholera (A.) from our consideration, examine some of the most remarkable instances which were put forward at the time, for and against, the doctrine of the communicability of the disease: the battle on this subject commenced with the appearance of the disease in Europe, and has been waged with more or less violence ever since.

In the first place I may observe, that there was never, probably, a greater effort made by the combined Governments of Europe, to exclude an epidemic disease from their dominions by quarantine, than that exercised in the case of cholera during 1830-31. I have already noticed the fact that in Spain in 1833 an infringement of these laws was punishable by death. In our own country, among the various instructions issued by the Board of Health in London, the following will give us an idea of the means by which it was hoped, in October 1831, to stay the progress of the disease in England: "Immediately separate the sick from the healthy;" "conspicuous marks to be set on infected houses;" "rags, paper, old clothes, and hangings to be burnt;" "dead to be buried in the vicinity of the houses selected for cholera patients;" "all persons employed about the sick to be kept apart from the rest of the community;" "articles of food to be placed in front of infected houses, and received by one of the family after the person delivering them shall have retired;" "all intercourse with an infected town and the neighbouring country to be prevented;" "troops, or a strong body of police, to be drawn around in-

fects places, so as utterly to keep the inhabitants from intercourse with the country.”*

It is true that, in very many instances, the strictest possible internal quarantine did not succeed in excluding cholera. That such should be the result of attempts at land-quarantine by sanitary lines in the populous parts of Europe, among a people accustomed to the utmost degree of daily intercourse, cannot appear surprising. To look for the rigorous enforcement of quarantine under such circumstances appears a vain expectation. And accordingly in Russia, Austria, and Prussia, where unlimited command of troops, and the despotic nature of the Governments present great advantages for the establishment of internal quarantine, the sanitary lines were nevertheless everywhere overstepped by the disease, after it had reached the more civilized parts of Europe;† as, for instance, in the case of Debreczyn, in Hungary, which suffered more than any other town in the country although guarded by a triple cordon. ‡

The greatest efforts were made to keep the cholera out of the Russian capital by means of quarantine; but these, as usual, having signally failed, a strong double cordon of troops was still maintained around Zarcoselo and Peterhoff, to which the court and nobility, with their attendants, in all 10,000 persons, retired, and resided in seclusion. In the beginning

* *Medico-Chirurgical Review*, vol. XVI, p. 267.

† *Edinburgh Medical Journal*, No. 37, p. 199.

‡ *Liverpool Medical Gazette*, vol. I, p. 277.

of October, the restrictions were withdrawn; and it was accurately ascertained that not a single instance of the disease had occurred within the enclosure, though it raged in all quarters around in the close vicinity of the lines.*

The French ambassador thus writes of the condition of St. Petersburg in 1831: "Kristofsky, situated in the middle of the populous islands of Petersburg, and which communicates with them by ten magnificent bridges, and with the town by a thousand barges, which bring every day, and especially on Sundays, very many people, who go to walk in the beautiful island, has been completely preserved from cholera; there has not been a single patient in the three villages which it contains. During the cholera, most of the French players retired to Kristofsky, and not a single patient was found among them; while out of the small number of their companions who remained in town, many either died from the disease, or were seized with its most violent form."†

Again: "On the St. Lawrence, opposite to Montreal, and within a very short distance of the city, is a small island called St. Helena. Immediately upon the breaking out of cholera at Montreal, the authorities removed the military to 'St. Helena.' The people from the island went every morning to make their bazaar, and

* *Official Reports on Cholera*, p. 58. By Drs. Russel and Barry. London, 1832. *Idem*, p. 203.

† *Observations sur le Choléra Morbus*. Par l'Ambassade de France en Russia. Paris, October 1831.

mixed with the inhabitants of the infected city; but notwithstanding this daily constant communication, there was never one case of cholera in the island during the whole time." *

In the report published by the French Government on the cholera of 1831, it was stated that, of 55,000 persons affected, only 164 were persons whose duties or profession obliged them to be near the sick. These 164 cases were from over 2,000 employed in the hospitals. In St. Petersburg, of 58 persons employed in hospital, 1 only had the disease; and at Moscow, of 123 people thus employed, 4 had cholera.

The Brig "Amelia" left New York (where cholera prevailed) on the 19th of October 1832, with one hundred and odd passengers on board; from stress of weather they were confined below deck. After the ship had been at sea six days, cholera broke out among the passengers. On the 31st of October the vessel was wrecked on Folly Island, and the people on board were at once landed. Up to this period twenty-four passengers had died of cholera, and several remained sick.

A boat's crew of wreckers were sent down from Charlestown to save part of the cargo from the wreck, and immediately after returning to the city one of these men was seized with cholera, and died. The patient resided in a most filthy part of the town, and was visited by "hundreds of curious people," but the cholera did not spread in Charlestown. The remainder of the wreckers

* *Report of the Committee on the Mauritius Cholera, 1856, p. 156.*

were sent back to Folly Island, and during the passage two of them fell sick with cholera and died. These wreckers are described as having been men of exceedingly intemperate and dissolute habits.

The crew of the vessel had from the very first been placed under strict quarantine on the island. Of four negroes, the only persons left on the island by the proprietor, three died—one a child, and two adults. Of the wreckers eight died. Of the guard employed to perform the duty of a *cordon sanitaire*, and who were stationed about 120 yards from the sick, nine were reported severely ill, and one died. The three physicians in constant attendance escaped; but a nurse, employed about the first wrecker who died, fell a victim to the disease a week afterwards.*

To take another illustration nearer home: The first case of cholera observed in the village of Moor-Monkton, six miles from York, occurred on the 28th December 1832. The disease did not exist at the time in the neighbourhood, or in any place within thirty miles. John Barnes, a labourer, had been suffering for two days from diarrhoea and cramp, when, on the 28th December, he was taken ill with all the symptoms of cholera, and died the next day. Barnes' wife, and two other persons who visited the sick man, were seized with cholera, but recovered. The son of the deceased man then arrived; it appears that he had been apprenticed to his uncle, a shoemaker in Leeds, and that his aunt had died of

* *The American Journal of Medical Science*, vol. XIV, 1834, p. 378.

cholera fifteen days before, her effects being sent to Barnes without having been washed. The trunk containing the things had been opened by Barnes in the evening, and the next day he was taken ill and died. This case is cited by the Cholera Commission of Constantinople in proof of the transmissibility of cholera by articles tainted with the dejections of cholera patients.

Dr. Bickes of Berlin, in *Henke's Journal of State Medicine* for 1832, assigns as the cause of cholera a miasm, which, having combined with the water of tardily flowing rivers and pools, is again liberated during the evaporation of these waters, and so mixes with the atmosphere; and that the latter, thus contaminated, becomes the principal pestiferous agent.

He argues that in countries surrounded by mountains and abounding in lakes and marshes, the cholera has been found to have prevailed most severely. Poland presents examples of this fact. The cholera appeared in Galicia on the 23rd May 1831. Galicia is shut in by the Carpathian Mountains and those of Siebenbürgen; the rivers Weichsel, Bug, San, Dniester, Pruth, &c., flowing through it with no very rapid stream, and the land is composed of bogs and marshes, interspersed with lakes. In this situation the number of individuals attacked relatively to 10,000 were 571, the deaths being in the proportion of 215.

In mountainous countries, through which streams pass with some rapidity, where no stagnant or retarded waters are met with, and where the foundation is

rocky and the soil sandy, the cholera has made very little impression. In Siebenbürgen, for instance, only 12 of 10,000 were attacked, and 6 of these fatally. Hungary gives a marked example of this: the general average of sufferers proved to be one-ninth to one-fourth of the inhabitants, and the deaths one-eighth to one-ninth or one-tenth; whereas in the hilly part of Eisenburg, of 10,000 persons only 6 were attacked, and only 1 in 12,000 fell a sacrifice.

Dr. Bickes next compares the number of cases occurring in inland towns, situated in a plain surrounded by mountains, with the number occurring in towns on the sea-coast. Of the former, Sassin had the greatest mortality, being, relatively to 10,000 people, 1,936 attacked with 1,030 deaths; this the author attributes to the locality of the town, which is a boggy slough, having streets that are very narrow and laid with planks. The greater portion of its inhabitants is composed of Jews and Gipsies, whose cleanliness is not remarkable.

Debreczyn, lying in a flat, in Hungary, *notwithstanding a triple cordon*, suffered 2,106, the greatest proportion of attacks, and 746 deaths.

Thorn and Posen, on the Weichsel, are of the same character—the former had 452 attacked and 286 fatally, the latter had 356 sufferers and 208 deaths.

Tilsit, washed by the Memel flowing through greatly infected districts, suffered in the proportion of 346 attacks and 189 deaths; while Bromberg, which is

about three leagues from this river, had a more moderate visitation, only 226 being attacked and 161 dying.

Dr. Bickes remarks that gradation of the cholera's intensity cannot be without a cause equally regularly varying in its potency. He concludes that the power of the contagious matter, evolved from the water with which it had combined, is augmented by the admixture of marsh miasmata, and that the current water of rivers will carry it in this compound state, and evolve it in different quantities and different degrees of intensity, according to the powers causing its disengagement.

I concluded the chapter on the epidemic cholera of 1817-23, by referring the reader to the opinions expressed on the subject by medical officers in Bengal; and I cannot do better before closing the history of the epidemic of 1826-33, than reproduce some of the views on cholera contained in an admirable article written at the time, and which seem to me to be thoroughly English in the common-sense practical view taken of the matter.* The author observes—

it is well to ask, if the means by which cholera is propagated is not strangely analogous to those by which the various societies of man intercommunicate. Like man, it travels along the high roads from town to town gradually, and attacks the most populous and commercial towns first. In its visits to an uninfected country, it selects the principal port or frontier town, and from thence takes the most frequented thoroughfare to reach the largest cities. If the means of

* *Quarterly Review*, January, 1839.

communication be rapid, the progress of the disease is rapid ; if they be slow, the malady lingers on its march ; if the distance be great, the time taken to travel is proportionally so. Finally, the capriciousness exhibited in the progress of the disease is accounted for on the supposition that it is communicated by human intercourse ; but remains inexplicable, if the cause of the propagation of cholera be looked for in the uniform action of physical agents and laws. In the case of the outbreak of cholera in Orenburg, and in many instances in India, we have remarked that the disease did not always attack the place nearest an infected town, but sometimes ranged from one place to another passing over intermediate points. If we believe the disease communicable from man to man, we can account for the facts, because the person who quits an infected spot travels in one direction rather than another, or remains not in the nearest but possibly in a more distant town or village. Above and beyond this, we cannot doubt that the surrounding circumstances of the individual after he had entered a certain locality must exercise a very great influence on the powers of the disease to extend ; these causes and others I shall subsequently explain determine the propagation of cholera from an uniform into an eccentric course : nevertheless this eccentricity is always confined to districts. The progress of the disease is singularly uniform over large spaces of territory, especially in countries like India, filled with trading towns, where commercial movement is uniform. The necessities of commerce, and the means by which it is carried on, are favourable to uniformity of movement over large spaces in all countries, although the act of progress will necessarily vary in each. The case however is different with regard to small districts ; now they who wish to avoid an infected town, remove from it how and when they like, and journey as fast or as slowly as it suits their convenience. The progress of the malady over large tracts of territory is like that of a traveller, or courier, who is obliged to use the modes of transport provided by customs, habits, and governments of the countries through which he passes ; while the propagation of cholera in a district follows the movements of residents whose wills are unfettered, and whose modes of transport are ever at hand."

The author of the article above referred to is very happy in his illustrations of the main argument urged in favour of the non-com-

municability of cholera—namely, that numbers of people exposed to contagion escaped the disease. He argues that negative proof, however convincing, ought not to be put in the scale against positive instances of communicability of the disease. What should we think of those who, having escaped the carnage of the battle of Waterloo, attributed their own immunity to the innocuousness of musketry? We were in the midst of the fire, they might say, ran all the same risks as those who fell; had bullets been dangerous and the cause of death, why were we not killed?

CHAPTER V.

EPIDEMIC CHOLERA IN INDIA, FROM THE YEAR 1830 TO 1845.

RESUMING now the history of cholera in India, we find that the outbreak which occurred in Bengal in 1826-27 had almost subsided by 1829. During the year 1830 the disease was only generated in this Presidency in its endemic area, and in the valley of the Nerbudda; it is doubtful if the western portion of this valley must not be included among the localities in which cholera is endemic. I have already repeatedly had to refer to outbursts of the disease in this part of India, and Dr. Stert remarks * that during August 1830, the district of Nemaure suffered from cholera in a very severe form, and that "for many years previously it had made its annual appearance" in the province. It again broke out among the native troops at Mhow in 1830.

Cholera was very fatal among the inhabitants of Calcutta and Berhampore during the month of November, † and also in the district of Palamow. ‡

* MS. Proceedings of Bengal Medical Board, December 1831.

† *Idem*, 28th October 1830; also 6th and 12th January 1831.

‡ *Idem*, 15th July 1831.

In April 1831 the disease was generated with terrible force among the prisoners confined in the jail at Shergotty. Dr. Woodburn states that cholera made its appearance "in these parts in April 1828, again at the same time in 1829, but not in 1830; in 1831 it visited us at the usual period. It did not burst out in all its fury on the day of its commencement, as in 1828, but gradually increased till it reached its acme and then subsided. From the 10th April to the 14th, four cases were admitted; all of these terminated favourably. On the 30th it recommenced, but till the 5th of May only 4 more prisoners were attacked, 2 of whom died. Between the 15th and 31st, 68 cases were admitted and 48 died; from the 1st to the 8th of June, 9 were admitted and 7 died. Of the 58 who died in hospital, 44 died within twenty-four hours of the time of being seized with the disease. Most of the prisoners were natives of the hilly countries of this province, having a climate totally different to what we have here; their difference in food also is equally great." The inhabitants of the surrounding country were under a severe outbreak of cholera at the same time.

Early in May the superintending surgeon at Dinapore reported that the disease had made its appearance in the Bhaugulpore, Monghyr, and Patna districts during April, "and to a still greater degree in Purneah"; it committed deplorable havoc amongst the native population, and visited some of the jails of this circle with extreme mortality. It prevailed to an alarming extent in Tirhoot during the month of June. In July, 24 of the European

soldiers at Benares were seized with cholera, and 12 of them died.

Epidemic cholera was evidently, therefore, severely felt throughout Lower Bengal, and in fact eastward from about 85° longitude ; but was scarcely generated at all to the west of this line, if we except a limited outburst of the disease among the troops at Mhow and Nusseerabad, in July and August.

The civil surgeon at Gaya reports that cholera had, "as usual," reappeared in that station in 1832, confirming Dr. Woodburn's statement as to the disease being endemic in these parts ; a fact to which most surgeons, marching along the Trunk Road in charge of troops to the east of Shergotty, will bear witness, for it was hardly possible to pass through this part of the country without some of the men being seized with the disease. The Bengal Presidency was singularly free, however, from epidemic cholera throughout this year.

Our attention is again fixed on the Shergotty jail in 1833. Dr. Marshall, the superintending surgeon at Dinapore, reports on the 16th July that cholera had broken out among the prisoners "with a malignity surpassing all I ever before witnessed."

"In the end of March and beginning of April cholera was prevalent to the eastward, particularly at Koonda and in the neighbourhood of Hazareebaugh. On the evening of the 7th April, one of the prisoners in the jail was attacked and died. On the 8th, 12th, 16th, and 18th, cases occurred, and 10 more on the 19th. On the 20th, 21st, and 22nd, 8 were admitted, all of whom died, excepting one. On the 23rd, 48 cases were admitted, and before eight o'clock in the evening 36 of them had died, and 6 more died during the night. In

the course of the following twenty-four hours, 9 more were admitted, 6 of whom died. From the 25th to the 30th, 27 were admitted and 11 died; altogether 105 cases occurred, and 75 died:" and this out of a community of about 600 people.

"It is very remarkable that of the 105 persons attacked, only three were men from this side of the Ghauts; there were a few from the hilly districts to the eastward, but the greater number were from the Nagpore prisoners."

It is no less remarkable that, at the present time, so surely as these hill men (Dhangers) are brought from their homes into the plains during our cholera months, as surely do they die off in the manner described by Dr. Marshall five-and-thirty years ago in the case of these Shergotty prisoners; and not only in this jail, but at Soorie and other localities the same phenomena have been observed.

In August 1833 cholera was generated among the European troops at Dinapore and Ghazeepore. On the 11th of September the superintending surgeon at Allahabad reports that "ten casualties have taken place, nine from cholera. Since I last wrote, the attacks of cholera have been less frequent in very many parts of the division; at Banda the mortality was very great." The superintending surgeon of the Cawnpore circle in his annual report for 1833, observes: "The year has been remarkable for an uncommon degree of heat, and the prevalence of destructive epidemics. This has not been caused by deficiency of rain, the total fall being 30 inches in fifty-three days, while last year it was only 18 inches, and the season was a most healthy one. From these epidemics the native troops suffered comparatively

little; and while cholera raged during the months of August and September, with a virulence hitherto unknown, in the cities of Lucknow, Cawnpore, Furruckabad, Futtehpore, and other large towns, out of a strength of 11,000 men, only 88 sepoys were attacked, and 26 died." "Every slight fall of rain was attended with an increase of the disease, and it did not entirely disappear till the end of September, when the wind changed to the west and the weather cleared up."

It is evident from the preceding history that cholera in 1831 only spread as far west as Benares, having apparently died out in 1832. We are naturally tempted to inquire if the exceptional season of 1832, as described by the Superintending Surgeon of Cawnpore, may not have influenced its progress.

It will be observed that the amount of rain which fell during the year 1832 in the Cawnpore district was far less than usual, a fact also noticed by Colonel Baird Smith, for, on account of the drought thus caused there was a partial famine in these parts in 1833. But no sooner had the rain of 1833 set in, than the cholera of 1831, which until then we may suppose to have been suppressed for want of moisture, instantly burst out and committed the terrible ravages described by the Superintending Surgeon of Cawnpore.

In 1834 the North-West was again under the influence of cholera. On the 7th August the Superintending Surgeon of Agra writes that "cases of cholera took place towards the end of the month (July); in the city the disease has been very severe, yet in the jail not a single

case has occurred." From Muttra Dr. J. M'Rae reports (5th September 1834): "During the month of July it rained incessantly; about the middle of the month cholera made its appearance in the city of Muttra and carried off great numbers. The rains ceased suddenly on the 3rd of August, and none fell till the 22nd; during this interval of hot, dry, sultry, enervating weather, the cholera spread all round Muttra, and from the 14th to the 22nd it prevailed to a frightful extent. Amongst the Europeans of the 3rd Troop of Horse Artillery it was characterized by early collapse of the system; blueness of the skin had commenced in several cases at so early a period, that the individual seized had no other symptom of indisposition than a feeling of general debility and slight relaxation of the bowels; vomiting scarcely made any part of the complaint, spasms were seldom present in the early stages."

At the commencement of the year 1834, the disease, in a very virulent form, was generated in Sylhet, Cachar, and Assam. Dr. Brown reports from the former district that "about the middle of May cholera broke out in Sylhet for the second time in the year, and spread with great mortality; it raged with equal violence from the 4th to the 22nd, when the weather was excessively sultry." "Cholera generally appears twice a year in this district as an epidemic, and at all times sporadic cases are met with." In fact, the inhabitants of Sylhet and Cachar were never absolutely free from cholera.

The disease was very prevalent at Dinapore throughout the whole of the first quarter of 1834.

We must now briefly consider a few details regarding cholera in the Madras presidency. In 1833 H.M.'s 62nd Regiment, while on the march from Chittore to Masulipatam, was attacked with a most severe form of cholera ; no less than 200 cases occurred in this regiment. Among the troops forming the northern division of the army, the mortality "in 1833-34 was much increased from the prevalence of cholera" in the Hyderabad subsidiary force, "the mortality being greater than usual in 1833-34 and 1838, in consequence of the great prevalence of fever and cholera."*

It was in June 1833 that the Rev. Dr. Wolff, who subsequently travelled into Bokhara in search of Lieut. Conolly, was seized with cholera (A.) on his way from Hyderabad to Madras. He writes : "I was attacked with cholera the instant I entered Mr. Bruce's bungalow, at Ramapotam. With no European near me, I commended my soul to God. I prayed to Him for relief, and had scarce done so before a voice exclaimed in English, 'I see you have the cholera morbus ; my husband died of it two months ago.' She was the wife of the late Sergeant Gillespie. She gave me a whole bottle of brandy with two hundred drops of laudanum, and other remedies. These remedies of my female mediciner stopped the vomiting at intervals. Dr. Cooper arrived next morning : he gave me warm water with salt, and twice forty grains of calomel ; this stopped the vomiting for two hours. He asked me whether I would submit to his putting a hot

* *Report on the Central Division.* Madras, 1843.

iron on my stomach, and, God be praised, it stopped the cholera morbus entirely.”*

In the Nagpore division, “cholera was very prevalent during the years 1833-34 and 1837-38, the greatest number of deaths occurring in June, July, August, and October.”

In the central division of the army, in “the years 1833-34 and 1838, the mortality was considerably increased, and almost solely by cholera.”†

In 1833-34 cholera was most severe among the troops of the Mysore Division. In the Ceded Districts, of which Bellary is the capital, and which includes the table-land lying between the Eastern and Western Ghauts, having an average elevation of about 1,600 feet above the level of the sea, “cholera prevails to a greater extent than in any other division of the army (Madras), the percentage of admissions as well as of deaths to strength being much above the average. It has frequently been observed that regiments, while marching through this division, are particularly obnoxious to outbreaks of this disease. The question here arises, to what influence are these attributable? and if to a deleterious exhalation emitted from the soil, how is it to be explained. that a regiment shall march over ground from one station to another in a perfectly healthy state, while in another body, on the

* *Narrative of a Mission to Bokhara in the year 1843-45*, p. 23. By the Rev. Joseph Wolff, D.D., London, 1846.

† *Report on the Medical Topography and Statistics of Northern Hyderabad and Nagpore Provinces*. Compiled and published by the Madras Medical Board, 1844.

same road, after an interval of only three days, cholera shall commit ravages? while, again, instances have occurred where a regiment has been severely attacked with cholera in its march, and another following the same road, after an interval of only two or three days, has altogether escaped." "The mortality was greatly above the average in 1833 and 1838, the result in both years of epidemic cholera."*

The Central Provinces and valley of the Nerbudda were also under the influence of widespread epidemic cholera in 1833-34. The Superintending Surgeon of Saugur states that the disease appeared at Hoshungabad at the close of the year 1833, "having raged epidemically for some time previously in the neighbouring villages. When it appeared, the weather was unsettled, the wind variable, and the temperature unusually high. The disease committed great ravages at Gurrawarra. During the month of October at Seuni easterly winds, as in the preceding year, prevailed in the end of June and July when the cholera first appeared, raging violently among the population." He adds, "Cholera and fever may be considered as endemical" in these parts. During the year cholera was prevalent among the shipping in the Madras Roads; and incidentally we hear of it breaking out among the crew of the "Peacock" while at Manilla† and at Trincomalee.

* *Report on the Medical Topography and Statistics of the Ceded Districts*, pp. 70-72. Madras, 1844.

† *Essays on the Origin and Progress of Cholera*, p. 107. By D. T. Bankier, R.N. Madras, 1835.

In May 1834 the Superintending Surgeon of Saugur reports "that cholera is raging throughout the high table-lands to the south, and at Mundla with greater severity than has ever before been known. In the neighbourhood of Bhilsa and Jhansi, the roads have been nearly impassable from the putridity of the numerous bodies. Some of the deaths have been very sudden, only two hours having elapsed from the first moment of attack." Among the European troops in the Bombay Presidency, the deaths from cholera amounted to 35 in 1831, to 113 in 1832, and to 263 in 1834.

It is evident, therefore, as I before remarked (p. 104), that the whole of the Madras Presidency, Central India, and Bombay* were under the influence of an outburst of epidemic cholera in 1832-33, which spread to the Hadjiz in 1835, and, I cannot help thinking, may have extended into the basin of the Mediterranean, Europe, and Africa, in 1836-37.

In 1835 epidemic cholera was at a very low ebb throughout Bengal; the districts of Chittagong, Bauleah, Midnapore, Purneah, and Hazareebaugh suffered from it, the troops in the latter station being also affected during May and June. The prisoners and troops in the north-western provinces and the Saugur divisions were well-nigh free from cholera. The Superintending Surgeon of Meerut, however, described an outbreak of the disease in April: "The weather early in the month was very hot, with prevailing easterly winds; several cases

* *Transactions of the Medical and Physical Society of Bombay*, for 1840, p. 79; also vol. I, new series, p. 97.

of cholera appeared among the Cameronians. On the afternoon of the 11th we had much rain; the temperature fell in a few hours 15°. This change was only temporary; the weather soon became hot and sultry. A number of cases of cholera appeared among the Cameronians, the rest of the troops remaining free from the disease." It does not appear that the convicts, civil population, or, in fact, any but the Cameronians, suffered from the effects of cholera at this time.

The year 1836 was another year of rest as regards cholera, with the exception of a second remarkable outburst of the disease among the Cameronians. The regiment having in the meantime marched from Meerut to Ghazeepore, cholera appeared among them about the 6th of May, and on the 26th assumed an aggravated form; no less than 113 men were attacked with the disease, and 21 of them died. It was impossible to account for this outburst of cholera by means of any of the current theories regarding the cause of the disease, and it is remarkable that although the number of men in all the ranges of barracks were equally affected, yet the mortality among those occupying the old barracks was exactly double of what it was in the new ones. The officers suffered fully as much, if not more, than the men; so localized, however, was the disease, that no cases occurred among the native troops, or the prisoners in the station.

The year 1837 commences with the history of cholera among the men of a detachment of H. M.'s 21st Regiment, which left Fort William on the 20th of February

for Hazareebaugh. During the march it was ascertained that "cholera raged in the villages on the Calcutta road between Bancoorah and Hazareebaugh; three men and one women were attacked during the march." "On the 26th of March, two children of H.M.'s 49th Regiment at Hazareebaugh were seized with the disease, and both died. On the next day the pestilence began to prevail generally in the regiment, with the exception of the flank companies; attacking men, women, and children, and raging violently in the sudder bazaar, 20 deaths having occurred on the 26th—all, in fact, that were attacked; for it was reported that not one had the good fortune to recover. The next day out of 20 cases from the sudder bazaar 10 died. The immunity of the flank companies from cholera was very remarkable, not a case having occurred in the barracks, but in hospital four men of those companies were attacked and two died. The exemption of the hospital attendants was no less striking." * Only one case occurred among the European artillery, and none among the native troops.

From Dinapore the Superintending Surgeon writes on the 15th of April: "Seven men, four women, and three children were admitted with cholera during the morning; the disease raged suddenly and fatally, as the simoon of a desert." On the 4th of April we hear "that cholera has been raging in the town of Ghazee-pore for the last two months among the troops; the first case occurred on the 11th of March. The stage of collapse had begun in almost all of them before

* MS. Proceedings of the Medical Board.

admission, and appears to have commenced immediately after the patient was taken ill." From Tirhoot Dr. M'Kinnon reports, 1st June, "that cholera is raging very fatally throughout this district." In July, the disease broke out in Benares, and prevailed to an alarming extent during that and the succeeding month. The Superintending Surgeon at Cawnpore reports, that "the great mortality from cholera among Europeans occurred between the 6th and 25th of August, since which time the disease among them has nearly disappeared. In the native corps, throughout the division, there have been occasional deaths from cholera during the month, but chiefly at the station of Cawnpore."

From the Saugur and Jubbulpore districts we learn that in May the mortality from cholera was very great; but Dr. Spilsbury reports that the disease "had not spread generally to the villages round Koorlee (where it first broke out), though many of them are situated quite close to it, but it broke out with considerable virulence in several other parts of the district very remote from each other." Jubbulpore was attacked in the middle of June. The districts to the south of the Nerbudda were severely visited by cholera, Seuni in particular; Nursingpore, Hoshungabad, and many other large towns were cruelly ravaged by the disease from June till October. Dr. Spilsbury adds that, since his residence in Jubbulpore, "cholera has usually visited the district every three years, travelling in one direction, slowly but surely, eastward, or in the opposite direction,

as during the cotton transit in April and May. It seldom visits the lines or regimental bazaars, the jail is quite exempt, yet the intercourse between the town and cantonments is very great; indeed, it is a constant stream of people passing to and fro throughout the day."

During the year 1837 cholera was very prevalent throughout the whole of lower Bengal. Excluding the Alipore Jail, I find that of some 15,000 prisoners in the Presidency circle, no less than 783 were attacked by cholera during the year; whereas in the Agra, Meerut, Kurnaul, and Nusseerabad circles, hardly any of the prisoners were affected by this disease. The same remark applies to the troops in these localities; nevertheless, in the last quarter of the year cases of cholera were recorded, though few in number, from almost every large civil or military station throughout the North-West. We have, therefore, in the history of the cholera in Bengal during 1837 a repetition of the phenomena of 1817, 1826, and 1833: a vast outburst of the disease occurring throughout the whole of Bengal gradually advancing to the west and north-west, as far as a line corresponding to about 78° east longitude; then halting for the cold season, but in the meantime throwing forward its feelers into the provinces beyond the invaded area.

Early in March 1838 the chief magistrate of Calcutta called the attention of the Medical Board, "to the number and severity of the cholera cases among the inhabitants of this city"; at the same time 126

men of H.M.'s 26th regiment in Fort William were seized with cholera.

The eastern districts, including Chittagong and Assam, were under the influence of a severe outburst of the disease. Among the men of H.M.'s 9th Regiment at Hazareebaugh cholera was prevalent throughout the year. The 31st Regiment at Dinapore and the 16th at Benares were similarly affected.

The troops at Cawnpore were terribly stricken with cholera in June. We have abundant evidence, therefore, of the reproduction of the disease over the invaded area of the previous year; beyond this, cholera was generated throughout the North-Western Provinces in 1838, and in Cabul in 1839.

On the 20th of April 1838, Dr. Ludlow reports from Agra, that "among the great number of destitute poor, amounting now to nearly one hundred thousand souls, collected in and about the city, cholera and fever prevailed to a woeful extent." The year 1838 was a year of famine in the North-West; but it is important to observe that the drought of 1837 producing this famine was not felt in the Allahabad circle, and only in one or two subdivisions of Cawnpore.* We have no history of a deficiency of rain in the latter district as in 1832, and consequently, the epidemic arising in Eastern Bengal progressed steadily over the province, as far as the Cawnpore circle.

The troops at Muttra were attacked by cholera in the beginning of April 1838, "the wind blowing from the

* Colonel Baird Smith's *Report on the Famine* of 1860-61, p. 23.

south and south-east"; at the same time the district of Etwah was severely affected. Dr. Clapperton reports in May from Mhow and Mundlairsir, that cholera had been virulent among the people of those districts since March, "the climate of the latter province being very much like that of Bengal." The inhabitants and troops of Meerut, Kurnaul, Deyrah, Seharunpore, and the hill station of Mussouree were under the influence of a fierce outbreak of cholera in July, the epidemic raging more or less violently until September.

The superintending surgeon of Meerut remarks that on the outbreak of cholera in his circle, "the atmosphere had been particularly hot and close, the rains fallen having produced very little diminution of the temperature." "The disease has only in a few instances partaken of the spasmodic form, but has been one of collapse; a few watery motions succeeded by sudden prostration of all the animal powers, the patient dying without a struggle in a few hours."

It would be useless my entering into further particulars regarding the invading cholera of 1838. The above quotations, which, it must be remembered, were written by officers widely separated from one another at the time, and on the spot where the disease appeared, seem to me precisely the independent evidence we require to prove the fact of the districts belonging to this Presidency, west and north-west of the Cawnpore division, being under the influence of a vast outburst of cholera in 1838.

Our troops entered Afghanistan during this year, but

no cases of cholera occurred among them until the following season. Dr. J. Atkinson reports from "near Cabul," that early in August (1839) "the camp at Quetta received a formidable visitation from cholera, which naturally produced great alarm. The cases were numerous and very fatal; the natives of the country were dying daily in great numbers, both in the town of Quetta and the neighbouring villages."* We have, in this and subsequent communications, evidence that during August 1839 cholera had passed into Cabul, as it had done in the epidemic of 1828, 1829; nor would it have been possible for us to have traced the further history of the cholera of the North-West and Punjab of 1838, had not our unfortunate army happened to be in the country at the time.

From the Madras reports it is evident that cholera was again very prevalent in that Presidency during the year 1837-38.† The disease was very severe at Bellary among the men of H.M.'s 39th Regiment. On the 21st and 22nd of March, there were a few showers and much lightning. On the evening of the former day the first case of cholera appeared, and between that date and the 21st of May 75 cases of cholera occurred in the regiment.‡

Among the European troops serving in the Presidency of Bombay, the deaths from cholera amounted

* MS. Proceeding of Medical Board.

† *Report on Epidemic Cholera*, p. 34. By Dr. Lorimer.

‡ *Report on Asiatic Cholera*, p. 56. By S. Rogers. London, 1848.

to 62 in 1837, to 53 in 1838, and to 259 in 1839.*

Throughout 1839 we have accounts of cholera from almost every large station in this Presidency (Bengal), the epidemic being reproduced over the whole country into which it had spread during the year 1837-38. The following table, compiled from the reports contained in the Proceedings of the Bengal Medical Board, illustrates the preceding facts connected with the progress of the epidemic in this Presidency with considerable precision :—

Table showing the average strength, and number of deaths from cholera, among the European troops in the Bengal Presidency for five years.

Troops stationed to the East of 80° E. Long.			Troops stationed to the West of 80° E. Long.		
Years.	Average strength.	Number of deaths from Cholera.	Average strength.	Number of deaths from cholera.	Remarks.
1835	6707	26	4707	3	† Of these, 25 deaths took place among the men of the regiment stationed at Ghazee-pore.
1836	7332	38†	5359	4	
1837	7144	120	4306	16	
1838	6375	52	7122	86	
1839	6011	38	5970	12	

*. *Transactions of the Medical and Physical Society of Bombay*, No. I, new series, p. 98.

During the early months of the year 1840, cholera "prevailed to an alarming extent throughout the greater part of Cuttack; it broke out again at the commencement of the rains." In the Berhampore division it was most severe in April, 153 cases and 74 deaths occurring among the convicts. The disease was very bad at Chinsurah; no less than 50 per cent of those attacked dying. In April and May cholera broke out at Dinapore and Ghazeepore, and recurred in these stations with renewed severity in November; the North-Western Provinces, Central India, and the Punjab remaining absolutely free from the disease throughout the year.

In the month of December 1840 Dr. Lamb reports from Dacca that cholera had broken out with much severity. "It first made its appearance on the banks of the river. The prisoners working there were attacked; but only a few cases occurred after they were relieved from the work in that direction. Only one decided case was reported from among the sepoys."

In January 1841 the 15th Regiment Native Infantry left Dacca for Benares in a fleet of country boats. They met the relieving regiment (the 45th Native Infantry) coming down the river. The latter corps had been perfectly healthy up to this time;

"not a case of cholera had occurred among them," whereas, in the fleet of the 15th Regiment, several deaths had taken place from this disease since leaving Dacca. The regiments anchored close to one another on the 25th of February, and on the following evening (the 26th), the first case of cholera occurred among the men of the 45th Regiment. The disease subsequently clung to the corps till it arrived at Dacca. It is further remarkable, that the 45th Regiment there

met the 32nd perfectly free from cholera; but no sooner had the 45th arrived among them, than the disease spread to the men of the 32nd Regiment, and in less than ten days 105 cases and 80 deaths occurred among the sepoys.

A "curious circumstance" is related by the Medical Officer in charge of the 45th Regiment. As I have above mentioned, they were anchored near the infected 15th Native Infantry on the 25th of February. "Opposite the boat of the grenadier company, on the banks of the river, were found some clothes that were discovered to have belonged to a deceased sepoy of the 15th Regiment, who had died of cholera. There was no doubt on this point, as, by some inadvertence, his undress cap was among the other articles. Within a few hours after this the first case of cholera occurred, and it is an odd coincidence that the patient belonged to the grenadier company; the next case was also a man of this company."

Epidemic cholera of a most malignant character invaded the Pooree and Jessore jails in March and April 1841, having been raging for some time previously in different parts of these districts, cutting off a frightful proportion of the population and in some places nearly depopulating large villages. Among the European troops at Dinapore, five cases were admitted into hospital on the 25th April; they all died within twenty-four hours. From the 15th to the 28th of April, there were no less than 95 cases and 51 deaths from cholera in the Tirhoot jail. The disease broke out at Monghyr on the 6th of April, and at Bhaugulpore about the same time. It is remarkable, however, that although these districts were suffering so severely not a single case occurred among the prisoners at Gaya, Arrah, Chuprah, or Chumparun. In May the disease appeared among the Europeans at Hazareebaugh. From the Allahabad and Cawnpore dispensary returns, we hear of the ex-

istence of cholera in these districts during June and July, many of the cases proving fatal within six hours; at the same time, the Jubbulpore and Saugur districts received a slight invasion of cholera. The disease was terribly virulent at Lucknow in July, several of the royal family dying from it.

Cholera reappeared over the whole of the districts above mentioned, including Chittagong, Assam, and Cachar, in September and October. From Cawnpore eastward, the number of convicts confined in the various jails amounted to rather more than an average of 30,000 souls, and during the year 1841 there were upwards of 800 deaths from cholera among them; whereas, to the west of Cawnpore, of some 16,600 prisoners, only 23 deaths occurred from the disease throughout the twelve months. In fact, the inhabitants of this presidency to the west of Cawnpore, with the exception of the slight outbreak in Central India, were free from cholera.

Early in 1842 we hear of the prevalence of the disease again in the Chaibassa, Dacca, Pooree, and Calcutta divisions, and, in fact, throughout lower Bengal. At Barrackpore, for instance, there were no fewer than 93 cases among the European troops in April, and 27 at Benares. It appeared with great severity among various fleets of boats proceeding down the Ganges. A remarkable instance of this kind, which, however, occurred later in the year, is recorded of H.M.'s 9th Lancers. Cholera was very prevalent among the villages about Monghyr, and no sooner had the left wing of the regiment arrived in this locality, than cholera broke out among the men.

"A few days later they emerged from the infected districts, and at the same time the disease left them." About a month afterwards, the men of the right wing, on their journey down the river, were affected with cholera at the very same spot as the former wing had been, and, pushing rapidly on, they lost it where the first division got rid of it." *

Although the season was a remarkably unhealthy one to the west of Cawnpore, there is no evidence of an outbreak of cholera among its inhabitants as we might have expected, from the great prevalence of the disease to the east, during the previous year.

Throughout the following twelve months we have again details of epidemic cholera in Bengal, and as far west as Ghazepore, where H.M.'s 29th Regiment, just arrived from Europe, suffered very severely.

"In July 1843 the disease became fearfully epidemic at Agra. It raged in the city and suburbs for upwards of two months prior to its assailing the prisoners, European and native troops, which, however, it did simultaneously in August, though in very opposite degrees. H.M.'s 39th Regiment and European Artillery suffered awfully, whereas the four native corps and camp-followers suffered comparatively very slightly. The European barracks, and the lines of the sepoy^s, as well as the bazaars, are in juxtaposition, and situated on an extensive open clear plain, elevated many feet above the level of the river; the soil is a sandy argillaceous composition. The season was marked by unprecedented

* *Medico-Chirurgical Review*, July 1848, p. 70.

severe thunder-storms, with deluges of rain : upwards of 24 inches fell in July and August, accompanied by great and sudden transitions of temperature." One hundred and sixty cases of cholera occurred among the convicts in the Agra jail. The disease was very prevalent throughout the Muttra and Allyghur districts, extending west as far as Boolundshahur, but not reaching Delhi. At Bareilly "cholera broke out with some degree of violence," * and the same remark applies to Moradabad. Among our European troops in the Meerut division there was only one death from cholera throughout the year, and in the native force but two cases. Not a single instance of the disease was met with among some 3,000 patients attending the Delhi dispensary during the second half of 1843. It is clear, therefore, that the cholera of this year failed to spread beyond a line to the north-west, corresponding to about longitude $75^{\circ} 56'$. To the south-west of this Presidency, however, it broke out in May in the Odeypore territory, and still earlier in the year to the north-west of this state.†

Throughout the year 1844 cholera was confined to its endemic area in Bengal, and even then appeared only in certain localities.

In the various outbreaks of the disease which took place

* *Half-Yearly Report of the Government Charitable Dispensaries for 1843*, p. 181. By Dr. Balfour. Printed by order of Government. Calcutta, 1844.

† "On the Vital Statistics of the Bheel Corps." By Dr. Ewart. From the *Indian Annals of Medical Science*, vol. xii, p. 495.

in India from the year 1830 to 1845, we have many remarkable instances of the fact that newcomers into an affected locality are peculiarly susceptible to the disease : for instance, the Dhaugers of Nagpore seldom get cholera (A.) when living among their own hills, but they no sooner came down into the plains than out of a community of 600 people some 105 of them are seized with cholera (A.) We may explain this fact upon the same principles as that which probably holds good in the case of the first outburst of the disease being far more deadly than subsequent periods of an epidemic. From causes which we cannot in the least comprehend it is evident that in any given number of people a certain proportion will be found, who are not susceptible to the influence which produces these epidemic diseases, so that it sometimes happens that persons who have never had typhus, measles, or scarlet fever, may occasionally nurse patients suffering from these various forms of disease and yet remain unaffected by them : at other times the very same people will contract the malady upon being brought into momentary communication with an affected person. So that we can easily imagine that in a place where cholera (A.) is endemic, all those persons who reside there, and who are capable of contracting the disease, are smitten by it at various times to a greater or less extent. But if the influence which engenders cholera is carried into a foreign country, or, what amounts to the same thing, if strangers are suddenly introduced into the infected area, as in the instance of H.M's 9th Lancers in passing Monghyr (p. 135), a number of them are struck

down at once by the disease, for no other reason than because they are susceptible to its influence; but the same effect as regards numbers might have been produced by a gradual process, extending perhaps over years had these same number of people been residing in the endemic area of the disease: under these circumstances some of them would probably have arrived in the place while the disease was inactive, others might have come when not susceptible of developing the contagion in their system. In fact, continuing the metaphor employed at the close of the last chapter, a definite proportion of them would certainly have escaped the bullets of the enemy, but might nevertheless be reserved for slaughter on a future occasion.

Another characteristic feature of cholera (A.) is referred to at p. 127, by Dr. Spilsbury, with reference to the disease spreading directly along the lines of human intercourse, first from west to east, and then in the opposite directions; and so localized was its action that it did not even extend from the trodden path to the neighbouring jail or cantonment. A second illustration of this feature of the disease occurred in the case of the fleet of boats conveying the 15th Regiment N. I. to Dacca; they were affected with cholera (A.), and met the 45th Regiment, which was perfectly free from the disease up to that time; but no sooner had the sepoys of the two regiments come in contact with one another than the men of the 45th Regiment were also attacked with cholera. The same thing happened a short time afterwards when the same 15th

Regiment N. I. met a second native corps (the 32nd), and again cholera appeared among the men of this hitherto healthy regiment from communicating with the diseased one. The history of the disease in the 45th Regiment is still more remarkable (p. 134), because it seems that cholera was in this instance conveyed to this corps, in the first instance, by articles of clothing worn by a man who had died of the disease. It is impossible to read this report in the MS. Proceeding of the Medical Board without being struck with its truthfulness, the narrator simply states facts that came under his immediate observations; he does not say one word about the nature of the disease, or enter on discussions as to its being contagious or otherwise; he appears to be an unbiassed witness simply relating the circumstances of the case as they came under his notice.

CHAPTER VI.

ASIATIC CHOLERA OF 1841-46, AND ITS PROGRESS INTO EUROPE IN 1847-49.

GEZER remarks in his article on cholera (A.) that the disease is endemic in the various countries bordering the straits of Malacca; but I have carefully examined the returns of the health of our convict, civil, and military populations which, in former times, were sent regularly from the Strait settlements to the Medical Board in Calcutta, and I find with regard to Singapore, Penang, and Malacca, from 1827-1840, that not a single death from cholera occurred either among the troops or convicts, at any one of these stations throughout this period. One or two instances of cholera are reported, but the patients recovered. The Madras records confirm the fact that epidemic cholera was absolutely unknown in the Straits during the period under review, * although within these fourteen years we have clear evidence of three great outbursts of the disease over Hindostan: in fact Dr.

* *Report on the Medical Topography of the Eastern Settlements.* Madras, 1844. Also the *Madras Quarterly Journal*, vol. i, p. 71. Madras, 1839.

Oxley, writing of the epidemic cholera in Malacca, remarks that the disease had visited the settlement in 1821 and 1826; "but since the last period no symptoms of the complaint have been observed; indeed the remembrance of cholera had nearly faded from all memories, when the present epidemic (1840) sprung up amongst us." *

I have already given references which demonstrate the fact that cholera (A.) was very deadly throughout Lower Bengal during the early months of the year 1840; and it was at this time the Government of India had collected a considerable body of troops in Calcutta and Madras to embark for active service in China. The various vessels constituting this expedition met at Singapore in April 1840; and Dr. Montgomerie, who was at the time our Superintending Surgeon at the Straits, and residing at Malacca, subsequently reported to the Medical Board "the remarkable circumstance that epidemic cholera broke out, early in the year, along the sea-shore towns bordering the Straits, and slowly advanced from the south to Malacca." It is impossible to trace the connection, if any, existing between this epidemic of cholera and the advent of our troops in the Straits on their way to China; but as the Bengal corps had come directly from a cholera infected district, and the disease broke out in the Straits, which were free from cholera until the arrival of these troops, it would seem very probable that cholera spread

* *Transactions of the Medical and Physical Society*, p. 329. Calcutta, 1842.

from Calcutta to our eastern settlement in 1840 through the medium of our soldiers. This idea is strengthened by the fact that there can be no doubt these same troops actually did introduce cholera (A.) into China, and, in this way, the English Government unknowingly inflicted on the unfortunate inhabitants of the Celestial Empire one of the most frightful visitations of disease to which any nation was ever subjected.

On the 4th of July 1840 our forces arrived in the harbour of Chusan, and the city was occupied by our troops on the following day. Dr. J. Francis was the Superintending Surgeon in charge of the "Bengal Volunteers," or native troops. In his report to the Medical Board in Calcutta he expressly states that, from inquiries made among the missionaries and other inhabitants of the place, he assured himself that cholera (A.) did not exist before the arrival of our troops there; and, further, that the disease in its epidemic form was unknown in the island of Chusan previously to this time. Our soldiers had hardly landed at Chusan before twenty cases of cholera occurred among them, and it spread to the inhabitants of the island.

Subsequent to this time doolie bearers, camp-followers, and soldiers, the materials for war, men, and stores, were constantly coming from Bengal and Madras, but no active military operations were undertaken until the following January; and from that time onwards we find more or less constant reference in the MS. Proceeding of the Medical Board to the existence of cholera among the sailors and soldiers constituting our army and navy

in China during the years 1841-42-43. For instance, in 1841 Dr. Francis again reported to the authorities in Calcutta that cholera, in an aggravated form, had broken out among the Bengal troops at Ningpo. "In August the disease was even of a more malignant form at Chinhai. Of nine men seized with it no less than six died." Dr. Bryson makes almost precisely the same remark as to the health of the fleet in these seas. He says cholera "seems to have prevailed in its most malignant form at Chinhai and Ningpo. Out of a party of marines serving on shore with the force, 10 were attacked and 6 died." * During the year 1842, 163 cases of cholera and 45 deaths occurred in our fleet; in 1843 there were 131 cases and 35 deaths from this disease. Dr. Bryson observes, "On a careful perusal of all the medical reports from the squadron (China), it appears that in every vessel employed in the Yang-tse-Kiang, from Woosung to Nankin, between the middle of July and October, cholera, or choleraic diarrhoea, broke out. The disease was alarmingly prevalent at Manilla." † Dr. Bryson expressly affirms that this was quite a new feature in the medical history of our fleet in the China seas, thus confirming Dr. French's evidence regarding the importation of the disease into the country, or rather the fact of cholera (A.) not being endemic there.

We have abundant evidence in the proceedings of the

* *Health of the Navy*, Part II; *East India Station*, p. 33.
Printed by order of the House of Commons, 1853.

† *Idem*, pp. 59, 81.

Medical Board as to the existence of cholera among the (Bengal) European and native troops in China, throughout the year 1841-42. No less than seven officers in H.M.'s 49th Regiment were attacked by cholera, and four of them died. "The disease committed great ravages at Canton and Peking, having first made its appearance in the former city."* Among the (Bengal) European troops employed in China during August and September 1842, amounting to about 3,000 men, there were 111 cases, and 49 deaths from cholera.

It is evident, therefore, that in 1840-42-43, the Straits settlements, and the entire sea-board of China, including Canton, were under the influence of epidemic cholera; and it is remarkable, without reference to this fact, that Professor E. A. Parkes, who was at the time serving with his regiment in Burmah, should have observed: "Some time in the early part of 1842 cholera appeared in the north of Burmah, and, passing in a southerly direction, committed great ravages at Ava and Amerapoura. After traversing these cities, it passed down towards Rangoon, pursuing the course of the Irawadi."† Dr. Richardson, Surgeon to the Commissioner of the Tenasserim Provinces, reports that the disease appeared among the prisoners at Moulmein on the 23rd of September 1842. "It was confined almost entirely to the convicts and to the Burmans"; a fact confirmed by Dr. Parkes, who informs us that the only "Europeans attacked at the

* MS. Proceedings, 9th February 1843.

† *Researches into the Pathology and Treatment of Cholera*, p. 166.
By Dr. E. A. Parkes.

commencement of the epidemic were the sailors belonging to the ships in the river ; the vessels nearest the shore suffered most. Thus, nine cases occurred on board H.M.'s brig 'Britonate,' lying close in shore. She was moved about a mile away, into the centre of the stream, and no more cases occurred. The attacks gradually diminished in number from November (1842) till the middle of May (1843), when the rains suddenly set in. There was then a great increase in the number of cases in the bazaar. On the 21st of the month, the first instance of the disease occurred among the European troops at Moulmein. From this time, up to the 1st of June, forty-one cases were admitted, after which, the rains having set in heavily, cholera ceased, and did not again attack the Europeans."

As I have already described the course of the Imperial road from Canton to Lassa, along which M. Huc travelled (p. 18), it will be unnecessary for me to return to the subject ; but I may mention the fact, that branching off from this road a great highway passed from Kin-jenen to Se-chin, and so to Yun-nan, Bamo, and the valley of the Irawadi. It was along this course that Marco Polo travelled, and it is in fact the trade route from Burmah to China ; it seemed very natural, therefore, that Asiatic cholera which was raging throughout the empire of China should have extended westward and along the course of human intercourse as above indicated ; and in this way we can readily comprehend how it was that Dr. Parkes remarks, "in 1842 cholera appeared in the north of Burmah, and

passed in a southerly direction to Ava and Amara-poura."

The progress of epidemic cholera from China to the eastward in 1842-43 was for a long time utterly unknown to us, because it is only within the last few years that we have had any knowledge at all of Chinese Tartary or Yarkund. The first envoy from Kashgar who visited Calcutta, came down to meet the Viceroy of India under the charge of Dr. H. Cayley, the British representative at Leh. I saw this Yarkund official with Dr. Cayley, and asked him about cholera. He informed us that the disease was almost unknown in Yarkund; but that in the year 1844 a malady of the nature of cholera "came from the side of China; that during that summer it attacked all the places on or near the main line of traffic from China; that in Kashgar, Yarkund, Kokand, and Bokhara, it killed thousands of people, that it lasted for a few weeks in each place, and the people died by hundreds every day, and that such a disease, so far as he knew, had only once before visited Kokand or Yarkund territories, some fifteen years previously, when it lasted for a year and came from the east. At the time of the second epidemic, 1844, there was the most free traffic between China and Turkestan, every year several thousand horse loads of tea passed from China through Kashgar and Kokand to Bokhara." The Yarkund envoy said very decidedly, that cholera came from China and travelled on to Bokhara. It seems very evident therefore, that the epidemic cholera which was imported into China by our troops from Calcutta in 1840-41, and which then extended throughout that empire, spread

during the year 1842 down into Burmah, and appeared at Yarkund in the summer of 1844. It probably reached this part of Central Asia by one of the northern roads, (p. 16); or it may have passed by the route (p. 18) through Lassa. From Yarkund it spread westward to Bokhara, and very probably along the old caravan route to Balkh.

It is remarkable that we get corroborative evidence bearing on this point from a source where we should little have expected to meet with it; for, towards the end of 1844, the Medical Board addressed the Government of India concerning a reported outbreak of the plague in Cabul, and in reply they received the following communication from Major Broadfoot, the Governor-General's Agent on the North-Western Frontier:—"In answer to your letter of the 16th December, I have the honour to inform you that the disorder at Cabul, called 'plague' in the newspapers, has advanced steadily from Bokhara to Peshawur, where, since the winter has set in, its violence seemed to have decreased, as well as its progress to be suspended, though it still exists in the Eusufzye country. The symptoms of the disease at Cabul and Peshawur are described as similar, and they appear to me to be those of cholera rather than of plague. They are, violent vomiting and purging, ending in death in a few hours, when the disorder is violent; all witnesses concur in this description of it, and it was similarly described to me a few days ago by an huzara of Cabul, who had the disease there and recovered. He had served under me in Afghanistan, and I think his description was probably correct; it was

precisely that of virulent cholera described by an unprofessional observer. As to precautions, I think it impossible to provide any which would be efficient on so extensive a frontier, the entrances into which are numerous, and not in our keeping." *

Dr. F. S. Arnott, of the Bombay Indian Medical Service, informs me that, "about the end of the hot season of 1844, the countries north of the Hindoo Koosh were devastated by cholera. Bokhara and Balkh lost upwards of 25,000 of their inhabitants; Samarkand and Koondooz also suffered to a frightful extent. Travelling south and east, it reached Bamian about the beginning, and Cabul about the middle of October. By the 8th of November it had extended to Jelalabad, and towards the end of November to Peshawur. In March and April 1845 it spread to Hoosun-Abdaul, and Jhelum, destroying 500 men of General Court's regiment at the former place. In May it broke out at Lahore, where it was supposed to have carried off 22,000 people. In June, having shown itself at Umritsur, it crossed the Sutledge, and broke out at Ferozepore, and afterwards at Loodiana, continuing its course towards Central India. It here sent off a ramification down the Sutledge and Indus to Sukkur, which place it reached on the 15th of June. It began to subside at Sukkur about the 26th of June, and by the beginning of July it had altogether ceased. It continued its course, however, down the river, and broke out at Hyderabad about the middle of July, and afterwards proceeded onwards to Tatta and Kurrachee; but by the time it reached the latter place it had abated much of its violence." †

This description of the course taken by the cholera of 1845 exactly coincides with that of the Governor-General's Agent on the North-Western Frontier, and with the information contained in the proceedings of the

* *MS. Proceedings of the Medical Board*, February 1845.

† *Transactions of the Medical and Physical Society of Bombay*, No. ii, New Series, p. 178.

Medical Board regarding the Bengal troops in these localities. Moreover, I have had the opportunity of writing to Dr. Arnott on the subject and he has kindly furnished me with all the information I required. Having been in Sind with his regiment in 1844-45, he was, as he states, at the time most anxiously watching the progress of this terrible epidemic. Dr. Arnott's evidence in fact, regarding this important epoch in the history of Indian cholera, is precisely of that description upon which we naturally place so much value: he was an independent eye-witness of the events he describes.

Ferozepore was the farthest point to the north-west occupied by British troops (Bengal) in 1845; and from the proceedings of the Medical Board, I find that, early in June, 36 cases and 19 deaths from cholera occurred among our troops stationed there; at the same time, instances of the disease were reported from Loodiana and Sukkur. Early in July it broke out with terrible violence among H.M.'s 31st Regiment at Umballa. In this and the following months there were no less than 339 cases and 187 deaths from cholera in this regiment; in the Sirhind division alone, within the three months (June, July, and August), 365 Europeans fell victims to this terrible disease, exceeding in number those killed in England's toughest battle in India—Sobraon, which was fought in the following February.

A sergeant of H.M.'s 31st, who was with the regiment in 1845, and happened to fill a post in an hospital lately under my charge, has given me some particulars of this outbreak of cholera, which I repeat in his own words:—

“The month of July set in with very heavy rain, which lasted for three or four days, and then the sun came out very strong, at which time the cholera broke out (about the 7th), and so great was the mortality, that after three days no coffins could be procured, so the men were sewed up in their bedding and buried as on the battle-field. We were ordered into what they call a cholera camp; unfortunately, just as the men got under arms, the rain poured down, and we were all drenched. The walls of the tents were blown in, the bedding soaked, and, I am sorry to say, that during that terrible night there were between 40 and 50 cases of cholera, but the men bore it like soldiers.” The sergeant further informs me that the wife of one of his comrades about this time had a baby; he had the child baptized after the eighth day, and had a christening party, getting the usual gallon and a half of rum from the canteen; there were twelve persons present, including the father of the child and his wife, and by the following evening all of them were in their graves from cholera, except the baby, who was taken care of by a lady now in Calcutta, and who confirms the above details.

In August 1845 cholera advanced eastward to Meerut, where during the month there were 29 cases and 9 deaths among the European troops; in September there were 114 cases and 76 deaths from cholera. In October and November the disease was severely felt in the Delhi jail; whereas, at Agra, there was not a single death from cholera among the prisoners or native troops in August or November, and only one casualty from this disease in October.

I have already quoted from Dr. Arnott's paper as to the existence of cholera in Sind, and, before leaving the subject, may add Dr. K. K. Kirk's evidence on the same point. He writes, "During the hot weather of 1845, cholera visited Sukkur and many other parts of Sind with much severity. In the cantonment bazaar, as many as 30 or 40 people were dying daily for some time. The disease was of a very severe kind, consisting only of a direct collapse, without spasmodic pains in the limbs, or the passive flow of the vital fluids from the skin and bowels. The attack was as insidious as it was dangerous, and some patients I saw presented no symptoms to excite alarm even in themselves, but lay in that quiet state which would have followed the withdrawal of their blood in small successive portions. Inflammation of the brain, with slight accompanying fever, carried off many who had successfully wrestled with cholera."*

In consequence of our operations in Sind, Kurrachee had risen to a place of some importance since the former visitation of Persia by cholera. In 1846 there were three European regiments stationed there, and on the 14th of June cholera broke out with terrible virulence among these men.† Dr. F. S. Arnott, who was at the time stationed at Kurrachee, in medical charge of the

* *Medical Topography of Upper Sind*, p. 41. By Dr. K. K. Kirk. Calcutta, 1847.

† *A Medical Report on the Causes, Character, and Treatment of Spasmodic Cholera in H.M.'s Regiment at Kurrachee*. By Surgeon A. How. Printed by order of the House of Commons, February 1848.

1st Bombay Fusiliers, had, as I have before remarked, noticed the fact of cholera having visited the station during the previous year, and he adds: "Isolated cases in the camp, town, and vicinity, continued to occur throughout the cold and hot season. It seems not improbable that the terrible disease of June 1846 may have arrived in Kurrachee in the previous year. That it did not previously show itself in an aggravated form, may, perhaps, be explained by the absence of certain adventitious circumstances necessary to its full development. What was wanting may have been supplied about the beginning of June, when the weather begins to partake of the peculiarities of the south-west monsoon, being loaded with moisture. Clouds accompany the wind sweeping over the southern coast of Sind."* Among the men of H.M.'s 86th Regiment, there were 410 cases and 238 deaths from cholera between the 11th and 25th of June; in the three European Regiments at Kurrachee, no less than 800 cases occurred within the space of a few days.

From this history we learn that the epidemic cholera of 1840-43 in China, as it extended westward—that is, in the course of human intercourse—had sent off a branch southward down the populous valley of the Irawadi into Burmah, it then spread north of the Himalayan range into Yarkund, and westward to Bokhara. It no sooner extended sufficiently far westward, however,

* "Report on the Health of 1st Fusiliers." By Dr. F. S. Arnott. *Bombay Medical Journal*, No. ii, new series, p. 179. Bombay, 1855.

so as to meet with other roads passing to the south, than it travelled along this route, and so reached Cabul in 1844, and from thence spread down the Indus to Sukkur and Kurrachee, and eastward from Afghanistan into the Punjab. Notwithstanding this offset of the Turkestan cholera of 1844 into Cabul, the disease still continued its original course, and spread westward into Persia in 1845. It is important to note these facts, because Dr. Arkhangelsky, and also Gezer and Hirsch, describe the epidemic cholera of Cabul in 1844 as coming from the Punjab, a statement which I believe is contrary to the true history of the disease.

General Ferrier was at this time endeavouring to travel from Teheran into the Punjab to join the army under Runjut Sing, and when at Memiana to the north of Herat, in June 1845, he first met with cholera: he distinctly and clearly states that although he had been residing for some years at Bagdad, and had travelled *via* Teheran to Meshed and Herat, he had heard or seen nothing of the cholera in these localities; in fact, he met the approaching epidemic coming from the east.* From Balkh the General travelled south into Afghanistan, and found cholera raging throughout the country; it was frightfully bad in Kandahar in July 1845; and on his return to Herat in December of the same year he found the disease had broken out in the town, and he had great difficulty in entering the place, the people fearing a fresh

* *Voyages en Perse, dans l'Afghanistan, le Beloukhistan, et le Turkestan.* Par J. P. Ferrier. Paris, 1870.

importation of the disease from Cabul. Cholera spread as far west as the town of Meshed before the close of the year 1845, and it burst forth there again with renewed violence in June of the following year, quickly extending to Teheran and Tabreez, and overspreading the province of Ghilan; before the close of the year it reached as far north as the town of Derbent on the Caspian Sea.

In September 1846 cholera appeared at Bagdad; it advanced up the Tigris and Euphrates as far as Diarbekir and Orfa; it did not, as has been affirmed by some, cross the desert directly from Bagdad to Damascus.* Nor does it appear to have travelled with the Persian pilgrims from Kerbellah across the desert to Mecca. Doubtless, as Verrollet asserts, cholera did break out at Mecca in November; but it existed at Jeddah during the month of May, when in all probability the seeds of the disease were sown, to be brought into active operation again by the assemblage of the pilgrims during the later months of the year, some 15,000 of them then falling victims to this pestilence in and about the city of Mecca.

"The further progress of the scourge seems to have been stopped by the approach of winter (1846-47); but early in the following spring it broke out with fresh virulence,"† and was reproduced over the entire area invaded by it during the previous year.

We must, however, pause for an instant and turn to

* *Cholera Conference of Constantinople*, p. 100. Calcutta, 1868.

† *Report of the General Board of Health on the Cholera of 1848-49*, p. 45.

the history of cholera in India during, and subsequent to the year 1845. The disease was very severe in Lower Bengal in the early part of the year. In April, we hear of its ravages in Maunbhoon, Furreedpore, Purneah, Tirhoot, and other districts. At the same time it "raged fearfully at Allahabad." On the 20th of June Dr. Darby reports from Cawnpore, "that during the last four days the station has been visited by that dreadful scourge cholera in its most malignant form." "The epidemic only raged for a few days and then absolutely and entirely disappeared." Had we not, therefore, evidence to the contrary, we might have supposed that the cholera I have described as appearing in the Punjab had spread, as we have invariably found it do heretofore, from Bengal; but the fact of the Agra division not having been affected in 1845, and of the steady advance of the disease from Peshawur to Delhi, leaves us in no doubt on this point. These facts demand our most careful consideration, for there is hardly a single circumstance connected with the history of the disease in India which bears more directly on its etiology than its progress in 1843-44-45.

Cholera appeared in an epidemic form in Madras during the month of June 1845. It spread gradually towards Bombay and the coast of Malabar.* Among the native troops in the Madras Presidency, there were 708 deaths from cholera in 1845, and 1,208 deaths in 1846.† From the returns of the Nizam's army, it is evident that epidemic cholera was

* *Medico-Chirurgical Review*, July 1848, p. 68.

† *Journal of the Statistical Society*, May 1851.

rife in his territories in 1845-46.* In the Satara district, the disease was prevalent; in May and June 1845, it was computed 1,000 fatal cases occurred in the town alone.† In the island of Ceylon also cholera was most virulent, particularly at Taffrea; out of 4,111 cases, no less than 3,655 perished during the month of November 1845.

Early in April 1846 we find that cholera was reproduced over nearly the whole of Western India, Madras, and Bombay. On the 21st of April, Dr. D. Macleod reports its appearance in the 58th Regiment, near Indore; 20 cases and 12 deaths occurring within a few hours of the outbreak of the disease. The troopers of the 5th Irregular Cavalry were similarly affected near Neemuch, and the 22nd Bombay Infantry on their march to Baroda. Dr. C. R. Francis reports the circumstance of the outbreak of the disease at Nusseerabad; and similar information was received by the Medical Board from Nowgong and Mhow. Dr. Spilsbury further reports that cholera had broken out at Hoshungabad, and that "it raged fearfully for several days at Saugur and Seuni among the natives, but had almost disappeared by the end of May."

While the epidemic was thus surging to and fro over the western portion of this presidency, we find it had broken out in Bombay. "An awful visitation of the

* *Medical Topography of the Nizam's Contingents and Army*, p. 74. By Lieut.-Gen. Fraser. Madras, 1852.

† Dr. J. Murray "On Diseases of Satara." *Bombay Medical Transactions*, vol. I. p. 98.

cholera is stated to have taken place at Sholapore and its vicinity, the disease first appearing in the camp of the 33rd Regiment, N.I., when on their march to Jaulnah. Spreading thence to the south Maharatta country, it almost depopulated several villages in its course, and on no occasion, at least for many years past, had it proved so fatal to the native population. It subsequently appeared at Poona, Bombay, and Ahmedabad *

It will be remembered, that I described the cholera of 1820 as affecting Western India, Madras, and Bombay, in very much the same way as we have seen that it did again in 1845-46 ; and in the former epidemic I quoted a passage from Mr. Fraser's work, to the effect that the disease had not only appeared in 1821 in Omaun, but that it existed on the Coast of Zangubar. It is remarkable that we have almost an exact repetition of these details in the history of cholera of 1846. Rigler† expressly states "that in the month of May 1846 cholera showed itself at Aden, Mocha, and Jeddah, and invaded almost the whole of the sea-board of the Arabian peninsula; it even penetrated into the interior of Omaun." The fact of the disease appearing at Aden in the early part of 1846 is confirmed by the Bombay medical reports, the only deaths from cholera among the European portion of the garrison, from 1840 to 1848, occurring in 1846.‡

* *Report of the General Board of Health on the Epidemic Cholera of 1848-49*, p. 3.

† Vol. II, pp. 441-443.

‡ *Annals of India*, p. 69. By G. G. Buist, 1848.

It is evident from these facts that during the year 1845-46, epidemic cholera of a most virulent nature had spread into Persia and Arabia from two sources, first, from the north, from central Asia ; and, secondly, from Bombay to the south. I have already referred to its appearing among the pilgrims at Mecca, in November 1846, and that it spread up the Tigris and Euphrates to Orfa. It was in consequence of this cross stream, if we may so call it, of epidemic cholera in this year that made its advance appear so capricious to M. Verollot, Dr. Baly, Sir W. Gull, and others who wrote concerning the outbreak of the disease in Europe during this and the following years.*

In April 1847 the disease appeared again at Derbent, and spread to Tenir-Khan-Showry, whence it was said to have been transmitted to Kizliar, in June, by a detachment of invalid soldiers. From Kizliar it spread along the steppes as far as the Volga, reaching Astrachan on the 30th of July. It had broken out at Tiflis on the first of the month, and spread from thence to the coast of the Black Sea, *via* Gori to Poti, and Trebizond. Following the great military road from Tiflis, the cholera spread over the Caucasus mountains, reaching a height of some 6,000 feet, and appeared at Stavropol. During August it broke out among the shipping at Taganrog, to the north of the sea of Azov, at the same time appearing at Saratov (August 20th) and in the Government of Orenburg. In September it reached Simbirsk and Nijhn-Novgorod to the north, and to the west Moscow, where

* *Reports on Epidemic Cholera*, p. 119. By Dr. W. Baly and W. Gull, London, 1854.

the disease was not severely felt during the year, confining its attacks chiefly to one particular district, near the river. Here, however, it assumed a severe character, for nearly one half of the cases that first occurred terminated fatally.*

Cholera broke out at Constantinople on the 24th of October 1847; † but from this time the epidemic began to decline over the area it had invaded. During the winter of 1847-48, some few cases were reported as far west as Alexandrof in Kherson, and Olgopol in Podolia not above thirty miles from the Austrian frontier, and others near Riga. Sporadic cases were noticed in France and Britain.

In the spring of 1848 we find cholera extending with renewed vigour, and by August it had advanced from the east as far as a line drawn through Arabia, Poland, and Sweden.

Having burst out at Mecca‡ and Medina in April 1848, it appeared with the returning pilgrims in Egypt in the middle of July, destroying some 3,000 of them at the Tintah fair, and committing terrible ravages over the whole country. In Moldavia and Wallachia the mortality from cholera was very great. The whole of Russia, Poland, Finland, and Sweden were under its influence before August, although the government of the latter country made most strenuous and costly efforts to bar its

* *Report of the General Board of Health on the Cholera of 1848-49*, p. 6.

† *Lancet*, vol. I, 1848, p. 101.

‡ *Cholera Conference of Constantinople*, p. 764. Calcutta, 1868.

advent by means of quarantine. As a general rule, however, there were but faint exertions made on the part of the governments of Europe, to restrict the advance of cholera by the enforcement of quarantine laws during the epidemic of 1848-49. It appears from a statistical paper submitted to the Russian Minister of the interior by Dr. Rosenberger, that from 1847 to 1849 the deaths from cholera in Russia exceeded the number of one million, and the number of towns attacked was 471, the communication between infected and healthy places being open. On the other hand, in the first invasion from 1829-35, when the progress of cholera was interrupted by sanitary cordons, the number of deaths did not exceed 100,000, and there were only 336 towns attacked. From these facts the Cholera Conference (Constantinople), assuming the intensity of the epidemic to have been the same on both occasions, argue that the restrictive measures employed in the first epidemic were, without doubt, useful. The value of this inference evidently rests on the assumption that the two epidemics were equally violent—a fact which Dr. Gavin Milroy questions, and he gives us data for concluding “that the diffusive energy of the epidemic of 1848-49 was considerably greater than that of its predecessor, invading a larger area of the world’s surface, and with more deadly consequences, than in 1831-32.”* If so, the force of Dr. Rosenberger’s argument regarding the advantage of sanitary cordons, is evidently much weakened, if not destroyed.

* Dr. Gavin Milroy “On Cholera,” *Medico-Chirurgical Review*, p. 446. 1865.

The disease had broken out at Berlin as early as July, and in September at Hamburgh and in Holland. The southern portion of the Austrian dominions appears to have suffered to some slight extent, and there was a partial outbreak of cholera near the port of Vigo in Spain. Italy was not affected at this time; Greece and Malta remained free from the disease, having been under strict quarantine from July. A few cases of cholera occurred in France toward the end of the year.

On account of the insulated positions of England and America, the circumstances of the advent of the disease in these countries could be more satisfactorily investigated than in most continental states. Dr. Parkes was selected to inquire into the history of the cases that occurred in London. From his account we learn that the first instance of the disease in the metropolis was that of a seaman named Harnold, who arrived on the 18th or 19th September, in a steamer from Hamburgh; he died of cholera at Horsleydown (London) on the 22nd of the month; the next case was in the instance of a man who slept in the same room with Harnold. There can be no doubt as to the fact of cholera having existed on board the steamer in which Harnold sailed, for the second engineer died from cholera on the passage, and we know the disease had been prevalent at Hamburgh for some time before the vessel started. During the first week of October, twenty-six cases were reported in London, all but four being fatal; of these eighteen occurred on the River Thames, or close to its banks,

the remainder being scattered over other parts of the city.

In Edinburgh, cholera first appeared on the 4th of October 1848. "On the Wednesday before this, three pilots from Newhaven went to the Isle of May to look out for vessels; one of them went on board a ship from Cronstadt, bound to Leith. The other two remained in their boat on the leese of the vessel and were towed to Leith, a distance of four or five and twenty miles; both of the men were seized with diarrhoea on their passage. On arriving at Leith they went on board the ship; one of them died on the following Sunday of cholera. During the next eight days several cases occurred among relations and immediate neighbours of the pilot who died, and these were the first cases in Scotland." * Unfortunately the vessel had left Leith before inquiry could be made as to her having had cases of cholera on board, but the disease was known to have existed in Cronstadt during the summer. The appearance of cholera at Hull and Sunderland was immediately preceded by the arrival of vessels in which cases of the disease had occurred during their passage from Hamburgh. †

The first instance reported in Ireland was in the case of a man who had arrived at Belfast on the 2nd of December from Edinburgh (already infected). He was sent to the workhouse, and died within a few days.

* *An Enquiry into the Bearing of the Earliest Cases of Cholera.* By E. A. Parkes, M.D. London, 1849.

† *Report on the Epidemic Cholera of 1848-49*, p. 140. By Drs. Baly and Gull.

Cholera spread to the inmates of the house, and from thence to the town.*

“America had enjoyed a cholera immunity of nearly thirteen years, during which the various portions of that continent were subjected to the same material influences that it had been during all the preceding years ;”† nevertheless, the time had now arrived when cholera was again to be carried over the Atlantic from Europe, and on the 2nd of December 1848 it broke out at Staten Island and New Orleans. Consequently, between May and December 1848, cholera had extended its influence from Moscow (37° E. long.) to the southern part of the United States of America (90° W. long.). I have already noticed the existence of cholera in Hamburg, Russia, and Holland. Towards the close of the year, a number of German emigrants arrived at Havre and embarked on board a vessel—the “New York”—bound for America. She sailed from Havre on the 9th of November, with 315 steerage passengers on board. There was no cholera at Havre when the “New York” started, and all remained well on board until sixteen days after leaving port, when cases of cholera occurred. The captain reported that on the 24th of the month a very chilly wind arose at sea, and the passengers finding themselves in want of warm garments, there was a general overhauling of baggage for warm clothing. The next day was very hot, and on that

* *Report on the Epidemic Cholera of 1848-49*, p. 142. By Drs. Baly and Gull.

† *Cholera Epidemic of 1873 in the United States*. Dr. Ely M'Clellan's Report. P. 607.

day the first case of cholera occurred among the passengers. It has been found, that on board the ship "New York," there was an emigrant who had clothing that had belonged to an individual who had died in Germany of cholera. During the day of intense cold, some articles of this clothing were taken from the chests and were worn by several of the passengers, and these passengers were the first taken ill on board the ship.* Before the arrival of the "New York" at Staten Island (the quarantine station in New Orleans) seven of the steerage passengers had died, and eleven cholera patients were landed from the vessel; the next day the number was increased to twenty with eight deaths. Nothing like cholera existed up to that time on Staten Island, or, in fact, in any other part of America. One of the men who assisted in removing the sick from the ship to the hospital was seized with cholera, and died two days afterwards. A nurse in the same building, without having any communication with the cholera patients, took the disease and died. Several other cases occurred among persons brought into contact with the sick, and among the emigrants there were sixty-three cases and twenty-nine deaths. The disease did not spread, although it is known that numbers escaped from the quarantine and went into the city (New York), and that a considerable intercourse was kept up between those who were within the enclosure and persons visiting them from without. In a filthy

* Professor A. Clark, "On Causes and Nature of Cholera." *Buffalo Medical and Surgical Journal*, 1867-68. Quoted by Drs. Peters and McClellan, in their *Report of Cholera*, p. 608. 1873.

German boarding-house, containing about 200 inmates, huddled together in the most disorderly confusion, two cases of cholera occurred in individuals who had escaped from quarantine. The establishment was broken up, and the inmates scattered over the city, and yet the disease did not follow. A sharp frost intervened; the weather, though previously mild and temperate, became wintry, and the disease entirely subsided.*

Nearly simultaneously with this occurrence in Staten Island, cholera was introduced into New Orleans. The "Swanton" sailed from Havre on the 3rd of November, having also German emigrants on board, these people having arrived, therefore, from an infected country. The passengers all remained perfectly well until the 26th of the month, after which "bowel complaints" broke out among them, and thirteen deaths occurred before reaching New Orleans. The vessel was not detained in quarantine. On the day after her arrival, one of the passengers was brought to the hospital in a state of collapse with cholera, and died soon afterwards. Three other cases of the disease, all fatal, were admitted from different parts of the city the same day. In these cases no communication with the ship was traced; the disease rapidly spread through the city. The weather was very warm and damp; "the streets were as muddy as possible, and the side-walks and walls were reeking with moisture; heavy fogs overhung the city till late in the morning." After the arrival of the "Swanton," the temperature, so

* *Report of the General Board of Health on the Cholera of 1848-49, Appendix C, p. 89. London, 1852.*

far from moderating, increased ; so that from the 16th to the 22nd of December the thermometer rose to 84° ; and the air was so liberally charged with moisture as to impart a stifling sensation. Under this condition of things the cholera spread with great rapidity.*

It is particularly to be noticed, that the passengers embarked on board these ships had arrived at Havre from countries in which cholera prevailed. When the disease appeared, the two vessels were 1,000 miles apart, and both far on their way to their respective ports. The first case occurred in the "New York" on the 25th of November 1848, when out of port sixteen days, and in north latitude 42° , western longitude 61° . On the following day, the 26th November, the first case occurred on the "Swanton," when twenty-seven days out of port, and in north latitude $25^{\circ} 47'$, west longitude $57^{\circ} 8'$. These cases appeared immediately after a sudden change in the weather, from an agreeable coolness to one of comparatively unpleasant warmth, accompanied by a particularly hot south wind, such as the captain of the "Swanton" had never felt before, and which he describes as more like artificially heated air than anything else.

From this time, until the arrival of these vessels at their respective ports, they retained the disease on board, and each sent cases on shore. Immediately after their arrival, cases occurred at Staten Island and New Orleans, in persons who had never been on board the vessels, and from this date cholera became epidemic in the

* *Report of the General Board of Health on the Cholera of 1848-49, Appendix C, p. 89. London, 1852.*

United States.* In fact, Dr. Fenner reports, that after the disease had once begun in New Orleans, almost every vessel and steamer leaving the port had twenty or thirty cases on board; and thus persons having cholera and dying with it, were carried to all the landing towns and cities up the river as high as Cincinnati. For instance, the steamer "Convoy," after a run of four days from New Orleans, and having had cholera on board, reached Memphis on the 20th of December. On the 22nd a boy was attacked with cholera; he had been on the wharf selling fruit at the time the "Convoy" arrived. The disease spread through the town and neighbourhood. It is remarkable that from the 20th October to the 29th December, with the exception of two fair days, it had rained incessantly; the ground was saturated with moisture, and the temperature was unusually high for the season of the year.

After a period of comparative rest, during the winter of 1848-49, cholera was reproduced in the spring over the greater part of Europe, America, and Canada. In Austria the disease did not spread to any considerable extent; there were cases, however, at Vienna early in the year.† The same remark applies to Spain, a few cases occurring at Gibraltar. Portugal remained free from cholera. After spreading over the south of France, the disease reached Marseilles in August; and soon

* *Report of the General Board of Health on the Cholera of 1848-49*, Appendix C, p. 77.

† *Lancet*, vol. I, 1849, p. 136.

afterwards Toulon, Nice, Genoa, Leghorn, and thence advanced to Naples and Brindisi, notwithstanding every attempt to arrest its progress.* Towards the end of the year, Tunis, Oran, and Algiers were more or less under the influence of the disease.

Cholera broke out at Paris in March, and by the end of June there had been 33,274 cases, and 15,677 deaths from it; the disease then gradually subsided and disappeared altogether in October. The epidemic was very general throughout France, and the history of its spreading into several departments has been carefully recorded; for instance, Hamel, a rural commune, was absolutely free from cholera until the 4th of April 1849, when a soldier named Guilbert arrived from Paris, where cholera was raging. After remaining ill in his father's house from diarrhoea for four days, he was removed to the hospital at Amiens; on the same day the soldier's brother, André Guilbert, who had constantly visited the sick man, was seized with cholera and died. Three days afterwards André's wife took the disease and died. Guilbert's father was attacked on the 11th of April, and died on the 15th; his brother and several other members of the family, together with a little girl who was in the habit of frequenting the house,† were all seized with cholera within a few days. †

Cholera was diffused more or less completely over the whole of England during the summer of 1849; the greatest

* Dr. Gavin Milroy "On Epidemic Cholera," *Medico-Chirurgical Review*, October 1865, p. 445.

† *Constantinople Cholera Conference*, p. 88. Calcutta, 1868.

mortality that occurred in any one place was at Hull, where it attained "the rate of 241 deaths to every 10,000 persons living."* Dr. W. Farr observes: "If a foreign army had landed on the coast of England, seized all the seaports, sent detachments over the surrounding districts, ravaged the population through the summer, after having destroyed more than a thousand lives a day, for several days in succession, and, in the year it held possession of the country, slain 53,293 men, women, and children, the task of registering the dead would be inexpressibly painful; and the pain is not greatly diminished by the circumstance, that in the calamity to be described, the minister of destruction was a pestilence that spread over the face of the island, and found in so many cities quick poisonous matters ready at hand to destroy the inhabitants."†

The disease in England, as in other places, was apparently very capricious in its habits, leaving the inhabitants of many localities unaffected, and in the serene enjoyment of health. But Dr. Farr on this occasion brought out with remarkable clearness the relation which existed between the elevation of the soil and the mortality from cholera; thus at 100 feet above the Trinity high-water mark, the observed average mortality was 17, at 70 feet it was 27, at 30 feet 65, and at high-water level 177; showing that human beings living on a low, and consequently, as a general rule, a humid soil,

* *Report on the Mortality of Cholera in England, 1849*, p. xxxvii.
By Dr. W. Farr.

† *Idem.*

were those most subjected to the influence of cholera.* The relationship thus established holds good, it must be remembered, only so far as this—that where the mortality was high the elevation of the soil was low; it by no means follows that all low-lying places were affected with cholera, and that the high levels escaped. Lyons for instance has always been comparatively free from cholera, although a part of the city is built on a low alluvial soil situated on the confines of two rivers, with a poor and dense population; nevertheless, it was unaffected by cholera in the epidemics of 1832 and 1835; the disease appeared in a single building only in 1849; a few cases occurred there in the epidemic of 1853, and none in 1865; the water supply of Lyons is stated by Professor Forster of Breslau to be particularly pure.

With regard to the spread of the disease in England, in 119 places, of which 69 were district towns or villages, 15 parishes or districts, and 34 public establishments, and the remaining one a private house standing isolated in the country, it was ascertained that in no less than 73 instances the disease appeared subsequently to the arrival of infected persons, or to the introduction of other possible vehicles of infection.† In some few towns, as at Shrewsbury and Oxford, and where the first cases occurred in public institutions, it was impossible to trace the importation of cholera to human intercourse. The disease did not appear simultaneously in all parts ulti-

* *Report on the Mortality of Cholera in England, 1848-49*, p. lxiv.
By Dr. W. Farr.

† Drs. Baly and Gull's *Report on Cholera*, p. 157.

mately affected, but began in one spot, or in a small number of spots, and increased by attacking a larger number of localities. In cities, it is true, it appeared in nearly all quarters or divisions within a few days ; but still in each quarter it affected one spot first and others in succession.*

I have already described the outbreak of cholera in Staten Island in December 1848 ; the disease did not make its appearance in the city of New York until the following May, when it first attacked some of the poorest and most degraded human beings on the face of the earth. Dr. Buel, of New York, states that on his first visit to these people in Orange Street, he found five of them, in various stages of cholera, crowded into a cellar, some ten or twelve feet square, with nothing over them but a few rags, and nothing under them but the mud floor. It appears that other cases had previously occurred in this cellar, for these poor creatures had been seized with cholera after celebrating a wake in commemoration of a departed friend who had just died of the disease. From Orange Street cholera spread over New York, and from thence to the various large towns on the American seaboard of the Atlantic, and, in fact, over the greater part of the United States. In several instances the commencement of the epidemic was traceable to persons arriving from previously affected localities ; but in New York and in other cities it was found impossible to trace the first instances of the disease to such a source.† Throughout

* Drs. Baly and Gull's *Report on Cholera*, p. 71.

† *Report of the General Board of Health*, 1848. London, 1850.

Canada cholera prevailed extensively between the months of July and September 1850. It does not appear to have extended from the east as in 1832, but rather from the United States. A few cases only occurred at Cross Isle, the quarantine station on the St. Lawrence below Quebec; whereas in the first epidemic this station suffered very severely.*

During the year 1850, cholera of a virulent type again broke out in Egypt, and along the whole of the African sea-board of the Mediterranean. It did not, however, in any instance, spread beyond three days' journey into the desert.† Slight outbursts of the disease at the same time occurred over the greater part of Europe and America; in fact, cholera was reproduced over the area invaded by it during the previous years. Beyond this, localities hitherto free from its influence were now attacked, as for instance Malta and Gozo. Cephalonia, one of the Ionian group, was affected in July, "the population being reduced to famine by means of the rigorous quarantine, which excluded them from all intercourse with Greece, and with their brethren;" nevertheless, Greece was preserved from cholera throughout this epidemic, as she had been in the former visitations of the disease to Europe in 1832 and 1837.

During the year 1850 cholera spread over Mexico and California. In October, Cuba and Jamaica were under its influence: this was the first time the latter island had been visited by cholera, and it committed the

* *Medico-Chirurgical Review*, 1865, p. 446.

† *Report of the Constantinople Conference*, p. 101. Calcutta, 1868.

most distressing havoc among the people. Mr. J. Watson, Surgeon to the Naval Hospital, Port Royal, and whose account of the disease in Portugal in 1833 I have referred to, reports that "for months past American steamers have been in the custom of touching at Port Royal and Kingston, on their voyage between New York and Chagres. About a week before cholera appeared in Port Royal, two young men arrived from Chagres, their father having died, shortly before they left America, of cholera." This was the only instance of a suspicious person arriving in the town which Mr. Watson could discover ; and as neither of these men, nor the inmates of their house, were affected with the disease, he concludes that it was not communicated to the inhabitants of Jamaica from a previously affected place.*

Dr. Gavin Milroy observes, in his account of the cholera of 1851, that fewer parts of the earth's surface seem to have been the seat of the disease, during these twelve months, than had been the case for many years previously. In Europe, isolated outbreaks occurred in Poland, Silesia, and Pomerania, but nowhere else ; so we may fairly conclude that the epidemic of 1848-49 had almost entirely subsided in Europe and America by the end of 1851, with the exception of localities first attacked during the previous year, such as Cuba and Jamaica, where the disease was reproduced in 1851.

It is important to keep these facts in mind, because, within the last few years, Dr. Tholozan and Arkhangelsky have propounded the notion that the great cholera

* *Lancet*, 1851, p. 40.

epidemic of 1853-54 arose from a fresh outburst of the disease which had ravaged Europe in 1848-49 ; but I shall show that this notion is hardly consistent with the facts of the case ; nevertheless, I admit, and Dr. Gavin Milroy insisted on the fact in his admirable article on the Geography of Epidemic Cholera, which appeared in the *Medico-Chirurgical Review* for 1865, that the epidemic cholera of 1848 had not entirely died out of Europe in 1851, and that it was unquestionably reproduced in Poland in 1852, and extended from thence to the frontier of Russia, Brandenburg, and Silesia, and into the Russian provinces bordering on Poland ; it broke out in St. Petersburg in October ; the disease extended, but without force, till the following May, when it subsided. There was never any question, therefore, as to the fact that the cholera of 1848-49 had not died out in Poland as it had done in the rest of Europe in 1850 ; and that in 1851, the year being a very hot one all over the Continent, the disease became as it were revitalized, and extended throughout Poland and some of the western provinces of Russia, and also along the left bank of the Vistula into Prussia. But the entire area of Russia situated between its north-western border and Trans-Caucasian provinces, as well as the rest of Europe, were almost exempt from cholera during the year 1852.

A remarkable outbreak of cholera occurred, however, during the summer of 1851, among the inhabitants of the Grand Canary Island ; it was one of those isolated cases upon which we naturally set much value in a history of

this kind ; and we are indebted to Mr. H. Haughton, the British Vice-Consul in the Canary Islands, for the following particulars regarding the epidemic.* He observes, that during the prevalence of the disease in Europe, even when it reached Cadiz, the Canary Islands, as well as Madeira, were preserved intact. The cholera had latterly been making great ravages in the West Indies. "About the 8th or 9th of May a vessel arrived from Havannah, *with a clean bill of health*, and was consequently admitted to pratique without any preliminary fumigation. It is said that the first house in San José (a suburb principally inhabited by poor people) in which the disease made its appearance, was that of a washer-woman, who had taken the mattress and foul clothes of one of the poorer passengers to wash, and that her children slept upon them during the night. Death soon followed ; one neighbour after another was slowly, but gradually, attacked ; the seed had found its appropriate soil, and slowly, but too surely, germinated." Supposing the articles from this vessel to have been landed about the 14th of May, four or five days after her arrival in the port, it was just fifteen days subsequently that the first case of cholera occurred, the disease having commenced on the 30th of May. It spread rapidly from the quarter of San José. Mr. Haughton remarks : "No pen can give an idea of our sufferings. It has been left to this insignificant place to complete the picture of horrors, so ably described by Daniel Defoe." No less than 9,000 deaths occurred among the inhabitants of this small island, and

* *The London Medical Gazette*, New Series, vol. XIII, 1851, p. 130.

most of them within the space of a few days ; the disease commencing on the 30th of May, and being at its height on the 10th of June. It began to decline on the 16th of the month.

The island was, of course, cut off from "all communication with the other islands" by order of the Spanish authorities ; and Mr. Haughton particularly notices the fact, that neither Teneriffe nor any other of the neighbouring islands were affected by the disease ; the cholera being absolutely and completely shut up in the Grand Canary Island in consequence of the strenuous enforcement of the laws to prevent people escaping from the pestilential spot.

Before concluding the history of the Indo-European epidemic cholera of 1840-50, I propose following out the plan of the preceding chapters, and giving a short summary of the ideas held by some of the leading English authorities of the time regarding the disease ; and it is hardly possible for us to pass over this period in the history of cholera, without alluding to the more important theories then advanced to explain the phenomena of the malady ; for these theories evidently exercised an important influence upon the line of investigation followed by inquirers in subsequent epidemics. I must, therefore, briefly consider these hypotheses, without expressing an opinion at present as to their value ; for, as we progress with our history we shall find, that much light has within the last twenty years been thrown upon the circumstances attending the outbreak and propagation of the disease, of which we may avail ourselves, before coming to a

conclusion on the very difficult subject of the etiology of cholera (A.)

It was from observations made during the epidemic of 1848-49, that Dr. J. Snow promulgated his views, that cholera depended upon a specific poison which is contained in the stools or vomited matter of persons suffering from the disease, in the same way as the poison of small-pox or scarlet fever is contained in the skin which peels off the bodies of persons recovering from these forms of fever. Dr. Snow considered that the poison which caused cholera (A.) having been swallowed by persons predisposed to the malady, acts directly on the mucous membrane of the intestines, at the same time being reproduced in the intestinal canal and passing out in the discharges much increased in quantity; he believed that these discharges afterwards, in various ways, but chiefly by mixing with the drinking water in rivers and wells, through means of a faulty system of drainage, reached the alimentary canals of other persons and produced the like disease in them.*

Dr. W. Budd, of Bristol, in a letter to the *Times*, dated 5th September 1849, expresses a somewhat similar opinion as to the cause of cholera. He supposes the disease to depend on a living organism—a distinct species of fungus, which being swallowed becomes infinitely multiplied in the intestinal canal, and the action thus excited causes the flux of cholera, which with its consequences constitute the disease. These organisms

* *On the Mode of Communicating Cholera.* By J. Snow. London, 1849.

Dr. Budd believes to be disseminated through society by their contact with food, but principally by the drinking water of infected places; and he consequently recommends as the most important means for preventing the progress of cholera to destroy the poison which continues to be generated in the bodies of infected persons, by mixing the discharges with some chemical fluid known to be fatal to beings of the fungus tribe, such as sulphite of iron or chloride of lime. And as water is the principal means of the dissemination of the disease when it exists, too much care could not be exercised in procuring pure drinking water.

The idea of cholera depending upon the presence of a fungus growth affecting the epithelium of the intestinal canal, had, however, originated with Boehm in 1838. This distinguished observer not only then described, but depicted, forms of cryptogamic growth amid the débris of the epithelium in choleraic dejecta. He remarks, that the matters found in the intestines after death from cholera "teem with vegetations of micro-fungi, and that innumerable round, oval, or elongated corpuscles are to be found in all the vomits and dejections, as well as in the intestinal canal; sometimes single, sometimes two, three, four, or more, joined end to end, as links of a chain." * Dr. Swayne published drawings of "cholera cells" in the *Lancet* for October 13th, 1849; but these were subsequently discovered by Mr. Busk to be the spores of a species of uredo, and other extraneous

* J. Simon's *Report to the Privy Council for 1866*, p. 518.

matters introduced into the intestinal canal with the food.*

Dr. W. Farr, reporting on the epidemic of 1848-49 in 1852, states that Asiatic cholera is induced in man by a certain specific matter the zymotic principal of cholera, which he proposes to call *cholerine*. "A variety of that matter was produced in India in certain unfavorable circumstances ; it had the property of propagating and multiplying itself in air, or water, or food, and of destroying men by producing in successive attacks a series of phenomena which constitute Asiatic cholera." He adds—"That *cholerine* is an organic matter cannot, I think, be doubted by those who have studied the whole of its phenomena and the general laws of zymotic disease. The great questions remain—Is *cholerine* produced in the human organization alone, and propagated by excreted matter? Is it produced and propagated in dead animal or vegetable matter, or mixed infusions of excreta and other matters out of the body? Is it propagated through water, through air, through contact, or through all these channels?" †

The London College of Physicians, in their report on the epidemic of 1848-49, published in 1854, replied to several of the questions put forward by Dr. Farr. The College gave it as their opinion that, on the whole, they consider Dr. Snow's theory untenable, observing "that it is not probable that in the case of cholera the influence

* *Lancet*, October 27th, 1849, p. 460.

† *Report on the Mortality of Cholera in England in 1848-49*, p. lxxx. By Dr. W. Farr.

of water will ever be shown to consist in its serving as a vehicle for the poison generated in the bodies of those who had suffered from the disease." *

The College were also of opinion that "the theory that the cause of the disease is a general state of the atmosphere," a general "atmospheric influence," or "epidemic constitution," has been found untenable; † they believe, "that human intercourse has, at least, a share in the propagation of the disease; and that under some circumstances, it is the most important, if not sole means, of effecting its diffusion," ‡ "the poison attaching itself to the surface of bodies, to the walls of rooms, and to furniture; it will also be collected by the clothes of persons living in infected dwellings, will be carried by them from place to place, and, wherever it meets with conditions favourable to its increase and action, will produce fresh outbreaks of the epidemic." § The College, however, observe: "It by no means follows that cholera is always propagated in this way; it may spread independently of communication between the sick and the healthy; the agent then most likely to have conveyed the poison from one spot to another is the wind."

Having discarded Drs. Snow and Budd's theory as to the origin of the disease they formed the hypothesis, that it was necessary for the spread of cholera that the poison should be received into a congenial nidus, in

* Drs. Baly and Sir. W. Gull's *Report*, p. 213.

† *Idem*, p. 214.

‡ *Idem*, p. 218.

§ *Idem*, p. 221.

which it might multiply and exercise its terrible power upon human beings susceptible of, and brought within, its influence. By means of this theory, the extraordinary exemption of certain localities from the disease was explained, the poison itself not having been carried by human beings, or the wind, into these exempted places ; or if introduced, and no deleterious effect following, it was argued that the poison could not have been delivered into a nidus fitted for its growth. It was impossible to disprove the negative propositions put forward by the College ; but they very certainly did not furnish a satisfactory solution to Dr. Farr's questions, although elaborated with extraordinary skill, learning, and ingenuity. Men naturally began to inquire for some more tangible evidence of the existence of this subtle poison, and wished for more explicit information as to the nature of the nidus necessary for its growth and propagation.

CHAPTER VII.

THE INDO-EUROPEAN EPIDEMIC CHOLERA OF 1848-53.

INDIA was, on the whole, comparatively free from cholera in 1847, the epidemic of the previous years having died out and but few cases being heard of beyond its endemic area. In 1848, out of an average force of 775 Europeans stationed in Calcutta, there were 20 cases and 13 deaths from cholera. From Dinapore, the Superintending Surgeon reported: "Cholera first manifested itself in her Majesty's 80th Regiment in the beginning of May; it was then raging in the native bazaar and villages around the station, and had proved fatal in many instances. Among the native troops, the visitation was, however, of mild character, and the mortality less than usual. The disease has always been prevalent at Dinapore, and may be termed rather endemic than epidemic." We hear but little of cholera at Benares, or Allahabad, in 1848; but there was a terrible outburst of the disease at Cawnpore, among the men of the 1st Bengal Fusiliers.

The Agra circle was affected to some extent at the same time. Sub-Assistant Surgeon Dhurmodoss Bose

remarks in the dispensary returns, dated October 1st 1848, that "cholera, though of a mild type, was generally epidemic from the latter end of August. It continued in the city (Agra) till the end of September, and then took its way towards the cantonments and the adjacent villages."* The disease did not, however, spread to the troops stationed at Agra; the Punjab, and the country to the north-west of Agra, were free from the disease throughout the year 1848. Dr. F. Corbyn, in his annual report from Lahore, remarks upon the great deficiency of rain throughout the Upper Provinces, and the peculiarly healthy nature of the season. †

Towards the end of the year another outbreak of cholera occurred among the 62nd Regiment native infantry which left Dacca for Moughyr in November, in a fleet of country boats. Before quitting Dacca, it was ascertained that some of the boatmen had died of cholera. The evening after the regiment embarked the first case occurred among the sepoys; the disease rapidly increased, and Dr. Cumberland, the medical officer in charge of the regiment, reported to the Medical Board, that the subsequent confusion and mortality among the men was so great, that it was impossible for him even to collect data as to the number of deaths that occurred, much less give any detailed account of this terrible outburst of disease.

From Midnapore, Issur Chunder Gangooly reports :

* *Half-Yearly Reports of the Government Charitable Dispensaries*, 1849, p. 196.

† MS. Proceedings of the Bengal Medical Board.

“Pestilential cholera prevailed to such a fearful extent in and about the station, that its effects in thinning the population were scarcely less powerful than in 1832.” The total amount of rain in June was about $8\frac{1}{2}$ inches, that of the same month last year (1848) was $14\frac{1}{2}$ inches; the total number of rainy days in June of both years was, however, equal. The rains set in on the 19th May, since which date to the end of the month there was scarcely a fine day, the partial and unrefreshing showers being productive of more harm than good. From the 5th to the 9th of June the rain was heavy, and from the latter date to the 15th of the month cholera was at its height.*

Baboo Gobin Chunder Dutt reports of the Pooree dispensary: We learn that “cholera broke out during the Ruth Jatra festival, in July; the pilgrims suffered principally.” In Gyah, “cholera was not so prevalent in the town, during the period under consideration as on former occasions, although its severity was very great in the district, where it first made its appearance in April, and continued till August.” In Patna, the disease “raged with great virulence in May and June;” it was very bad again in August and September.

From Tirhoot, Dr. Kinsey remarks that, during the six months ending 1st October 1849, “cholera had carried off numbers of the population throughout the district.” † The disease “invaded the city of Mirzapore in the month of May, and, although the duration was not

* *Half-yearly Reports of the Government Charitable Dispensaries, from 1st April to 30th September 1849*, p. 34.

† *Dispensary Reports for 1849*, p. 60.

long, yet the ravages were comparatively frightful in the adjacent villages, specially those lying on the southern boundary of Mirzapore. The devastation was terribly frightful ; it was reported that the inhabitants fled for refuge to other districts, forsaking their habitations, cattle and property."* "Towards the latter end of May cholera broke out with its usual severity at Allahabad and carried away many ; this disease prevailed epidemically throughout the station and surrounding country."

In Allahabad and Cawnpore, cholera appeared among the European troops in July and August, and "was raging in the city" during these months.

There were no less than 136 cases and 88 deaths among the convicts confined in the Jubbulpore, Saugur, Nursingpore jails during the year 1849, and the disease was very prevalent among the inhabitants of these districts.

Dr. Leith informs us, that "cholera made its approach (to Bombay) from the eastward, towards the end of the rains of 1849. It had prevailed more or less severely in the southern 'Malwatta' country, and the neighbourhood of Shelapore, in the month of May ; and, in the middle of July, in the Ahmednuggur and Poonah collectorates ; but it did not then extend further northward.

"During the week preceding the invasion of the epidemic, rain, which had been unusually abundant, fell daily, and at the rate of $1\frac{3}{4}$ inches a day, and the south-west monsoon blew during the same week with a force

* *Dispensary Reports for 1849*, p. 60.

varying from $1\frac{1}{2}$ to 5 lbs., or an average of $3\frac{1}{2}$ lbs. on the square foot, which is equivalent to a velocity of more than 25 miles an hour, in a direction contrary to that in which cholera advanced.

“The first four fatal attacks took place in the three different divisions of the island ; and from 4th to 12th August the fatal cases that occurred, fifteen in all, were scattered over four divisions, six districts, and twelve streets, some of which were widely separated from each other by densely-peopled portions of the town. These fifteen sufferers belonged to seven different castes, and eight different occupations, and none of them had recently arrived in Bombay.”

Throughout the year 1850, cholera was reproduced with considerable virulence over the whole of Bengal proper ; Cachar, Sylhet, and the eastern districts suffering very severely.

In August it “raged with great violence at Jubbulpore ;” * the prisoners were attacked by the disease, but, being speedily removed from the jail, it disappeared from among them. Dr. J. Squire reports the prevalence of cholera at Seuni and Baitool † throughout the hot and rainy season. It is evident, therefore, that the south-western districts of the Bengal presidency were under the influence of epidemic cholera in 1850 ; and at the same time the disease was severely felt in Bombay, as is shown by the following table :

* MS. Proceeding of the Bengal Medical Board for 1850.

† *Idem.*

Years.						Number of deaths registered from Cholera in Bombay.
1848	...	...	...	...	...	69
1849	..	...	..	...	...	2,269
1850	...	...	...	...	...	4,729
1851	...	...	...	..	...	4,020
1852	...	...	...	...	...	1,135
1853	...	...	...	...	...	1,339

I am under very considerable obligations to Dr. W. Mackenzie, C.B., Principal Inspector-General of the Indian Madras Medical Service, who although a perfect stranger to me has gone out of his way to collect and copy papers, and afforded me most valuable information regarding the mortality among the troops of the Madras native army. It would appear from these documents that cholera was rather more prevalent than usual in the Madras presidency in 1849-50; but it is unnecessary for me to adduce further evidence as to the fact of the progressive generation of cholera from east to west in 1849, the mortality from the disease being very great along the western seaboard of India in 1850.

In 1851 the disease broke out in the south of Persia. M. Robinet submitted to the Academy of Medicine at Paris the following note, dated Constantinople, October 28th, 1851: "The cholera, after having ravaged Bassorah and the Persian frontier, has arrived at Bagdad, where it is committing great ravages. The disease will probably ascend the Tigris, and it will be due here (Constantinople) by next autumn, or beginning of 1852-53. The Board of Health has decided that it will not

adopt quarantine."* This forecast of the course to be taken by the cholera was fulfilled to some extent even during the year 1851, as we learn from Mr Colvill, civil surgeon at Bagdad. In his more explicit account of this outbreak of the disease he writes in 1851, "Cholera appears to have broken out at Bassorah on or about the 10th of June; but as our agent then died, there are no particulars. By the 17th July, the disease was then beginning to abate, after carrying off 800 persons; but it spread to Mohammerah and Sheik-el-Sook on the Euphrates; from this place it went to Nejef, and then appeared at Hillah. On the 11th September it broke out at Bagdad, and on that day there were six fatal cases. The disease lasted fifty days, disappearing on the 17th November. In that time 1,847 deaths were recorded. It then passed northwards to Kefri and Kerkook." †

Dr. Bartolette, speaking at the International Sanitary Meeting of 1866 in the presence of Dr. Pelikan, the Russian member at the conference, gives us further details of this epidemic of cholera in Persia. He remarked that in 1851 the French consul at Bassorah announced that cholera had broken out in that town. By the 2nd of July the mortality had increased to 40 and 50 daily. The first who fell a victim to the disease was the director of the quarantine. On the 16th July the British consul wrote that cholera had shown itself, with great intensity, at Mohammerah. On the 24th it appeared at Samarat and Sinafieh, and on the 29th at Imam Ali, where, during

* *Medical Gazette*, vol. XIII, 1851, p. 953.

† Supplement to the *Gazette of India*, January 1872, p. 113.

the height of the epidemic, the daily mortality reached 20. On the 12th August the disease showed itself at Hillah. From the 12th August to the 7th September the number of deaths among the population amount to 1,080, and among the military to 48, the population amounting to 20,000. On the 11th September the epidemic declared itself at Bagdad, where, down to the 18th November, it carried off 1,587 victims from amidst a population of 600,000. On the 18th September the cholera showed itself at Imam Mousa, an hour's journey from Bagdad ; in one month there were 433 deaths in a population ordinarily very limited, but which at that time comprised 12,000 Persian pilgrims, among whom the epidemic raged. The disease took two routes—the one from Bassorah towards the west, reaching Souh-el-chuk, Samavat, Sinafieh, Imam Ali, and Hillah ; the other towards the east, by Mohammerah, attacking many nomadic tribes, and Suleimanieh and Revandouz successively. According to Dr. Belleli, a sanitary physician, the Persian pilgrims contributed to spread and maintain the disease, owing to their overcrowding and their great numbers in the towns and villages at which they were in the habit of stopping. (See the reports of MM. Radoun and Belleli.)* We may form some conception of the part which these Mohamedan pilgrims play in the spread of cholera over countries like Turkey and Persia from a statement made by Dr. Bartolette that, from the 1st of December 1849 to 1st of December 1850, there passed through the station of Khanequin 52,053

* *Proceedings of International Sanitary Conference, 1866, p. 392.*

pilgrims, with 64,138 beasts of burden, 4,504 muleteers, and 2,837 loads of human corpses, which, giving two dead bodies to a load, would amount to 8,000 corpses to be buried at Kerbelah.* It is certain that cholera broke out in the caravan of pilgrims proceeding from Mecca towards Damascus during the year 1850, so that we may presume that the disease existed in the former city during this year.

Dr. Bartollette further remarked, that in the first half of the year 1852, some sporadic cases of cholera were observed at Bagdad and other places in Mesopotamia, the disease having previously raged in many districts and villages of Persia. On the 17th November the disease, according to a dispatch from the British minister at Teheran, was at Tauris.

M. Sawas, the Persian delegate at the Constantinople Sanitary Conference, observes that in 1852, "the disease crossed the frontier and passed into Persia, whence it invaded Russia by way of Astrakhan." And Dr. Gavin Milroy reports that, during this year, cholera spread over various districts of Persia, following the course of the Tigris, it again appeared at Bagdad in the spring, and thence, traversing Kurdistan, extended into Azerbaijan, in October, ravaging its capital, Tabriz, with great fury, and killing some 12,000 of its inhabitants; it then seems to have followed a south-east course along the borders of the Caspian Sea.† Dr. Arkhangelsky writes that cholera (A.) occurred in the district of Azer-

* *Proceedings of International Sanitary Conference*, 1866, p. 392.

† Milroy on the *Geography of Epidemic Cholera*.

bijan, and further, that it spread during the year 1852 along the valley of Urmia. The number of persons who died from it in that district amounted to about 3,000. Cholera was very severe at Sulduz and Khoi (September 11), and it also spread along the road from Tabriz to Nakhitchewan, and reached as far as Germerud. At the same time the epidemic spread to Agar, and also Takmendash, on the road to Teheran. Dr. Possof reports that, on the 26th November 1852, he met with cases of cholera in the Government of Erivan, and in the city of Ordubat, as well as in several Russian villages in the valley of the River Aras. Towards the end of the year it again made its appearance at Agar, Karadag, and continued to exist at Ardebil in January 1853. Dr. Fagergren, the medical officer of the province of Fars, informs me that cholera existed in Shiraz during the year 1852, and that this was the first time he had met with it there during a residence of twenty-five years in the country.

It seems to me therefore perfectly clear, that in 1849-50 epidemic cholera was vastly on the increase in Western India, especially in Bombay; and that during the following year it broke out at Bassorah, a port to the north of the Persian Gulf, and between which and Bombay there is extensive traffic. From Bassorah the disease extended up the rivers Euphrates and Tigris, towards the north of Persia; it subsided during the cold season. But in the spring of the following year (1852) the disease not only broke out again over the Turkish and Persian provinces which it had visited during the

previous season, but it extended still further north, into Russian Trans-Caucasia. At the same time that cholera was again extending westwards from India, through Persia and Turkey, into Europe, we have seen that the epidemic of 1848-49 had not died out in Poland (p. 175), and had extended into some of the north-western provinces of Russia, so that, at the end of 1852, the inhabitants of the northern and western provinces of Russia were under the influence of the cholera of 1848-49, and the inhabitants of her Caucasian provinces were again subjected to a fresh importation of the disease from western India, through Persia.

In the meanwhile, epidemic cholera had extended over the north-western provinces of India during the years 1850-51. The civil surgeon of Muttra, in his *Fail Report* for 1850, expressly states that the mortality from cholera in the middle of August was very considerable, especially among the pilgrims.

"The disease prevailed to a very great extent in July at Bareilly."* At the same time it broke out in the Mooradabad district, and "prevailed epidemically to the end of September." "In the early part of 1852 extensive works of irrigation were in progress at the foot of the Himalaya mountains in Kumaon. Several thousand workmen were collected there from the neighbouring hills. Cholera broke out among these people with great virulence, and they fled panic-stricken to their homes, which were generally at a distance of several days' journey

* *Half-yearly Reports of the Government Charitable Dispensaries, from 1st April to 30th September 1852*, p. 227. Calcutta, 1854.

in the interior of the hills. Up to this time cholera had been unheard of in Gurwhal, or in any of the neighbouring mountains. This is a fact that was carefully inquired into and thoroughly ascertained. Many of the work-people who fled from Kumaon died on the way to their homes; many others were attacked when they reached their villages. There, cholera broke out among the other inhabitants of the villages, commencing, in very many instances, in the families of the men who had brought the disease from below. For a considerable time cholera was entirely confined to places which had been in direct communication with persons suffering from the disease; but in the course of a few weeks it had become impossible any longer to trace such connection, and cholera became generally epidemic through the hills.”*

In the district of Kumaon it “made great ravages,” appearing at Almorah from May to the end of July.† It was fearfully bad at Deyrah Doon and Seharunpore, whence it spread to Umballah.‡ Rajkristo Chatterjee reported from Simla that, “during the hot months of July and August, when the atmosphere was close, and there was an uninterrupted fall of rain, the interior was visited by cholera, which was strictly epidemic in its character, and carried away numbers of poor people.

* *Report of the Commissioners appointed to inquire into the Cholera Epidemic of 1861*, p. 202. Calcutta, 1862.

† *Half-yearly Reports of the Government Charitable Dispensaries, from 1st April to 30th September 1852*, p. 262. Calcutta, 1854.

‡ *Idem*, p. 308.

From the intelligence received from W. Edwards, Esq., and the Rev. Mr. Merk, of Kotgurh, we immediately sent a native doctor, with cholera medicines, to meet the wants of the poor people occupying those hills. At about the same time cholera broke out in the western confines of Simla, at Jottogh, whence it entered the station, but did not commit much damage among its inhabitants."

At the time, therefore, that the disease was spreading over Central India and Bombay, and from thence to the Persian Gulf, it was being generated from east to northwest, over the Punjab and Himalaya; but in this direction I am unable to trace it any farther. Supposing, however, the disease to have pursued the path it had followed on previous occasions—through Cabul and Mushed to Teheran—it would have appeared in this latter place in the summer of 1853. And in fact a fearful outbreak of cholera occurred in the north of Persia in May and June of that year, which, I cannot help thinking, must have been partly due to an offshoot of the Punjab epidemic of 1852. It is true we have traced the cholera *via* Bassorah to Bagdad and Tabriz, and in towns on the road to Teheran, in 1852, and it may be that the epidemic of 1853 in the north of Persia was simply a reproduction of this cholera; but the disease was so fearfully destructive, striking with such irresistible force the inhabitants of Teheran, that I am inclined to believe it originated from the sources above indicated, being in fact an offspring of the Bombay cholera of 1849-50, and in addition receiving

fresh vigour from the Punjab cholera of 1852. Some 15,000 of the inhabitants of Teheran were killed by it, out of a population of 100,000, during the months of May and June 1853.

The disease had, on the 15th June, reached Astrabad, on the Caspian Sea, and Bushire and Shiraz by the 29th of the same month. Apprehensions existed of an invasion of the epidemic by the coasts of the Persian Gulf, as had occurred at Bassorah in 1851. By the 13th June cholera had already reached Hamadan and Kermanshah, on account of which it was thought proper to subject arrivals from Persia to a quarantine of observation, and to prohibit the entrance of corpses into Ottoman territory. On the 19th October the inspector announced that cholera had reached Bassorah, imported *via* Mohammerah. The troops of the Shah, ravaged by cholera, scattered themselves, and disseminated the disease throughout Persia. On the 18th November it passed from Persia, *via* Bassorah, to Bagdad.*

In fact during the spring of 1853 the whole of Persia, especially its northern provinces, was under the influence of a severe outbreak of cholera (A.), and the disease extended again over Mesopotamia, having been introduced from Persia *via* Mohammerah and the Tigris.

At the same time that cholera was extending, for the third year, over Persia (1853), it was also showing increased energy in Russia and the north of Europe. It broke out in Denmark (at Copenhagen, and in

* *Report of the Sanitary Commission.* Constantinople, 1866.

August), and, in a few months, in Norway. In England cholera appeared first at Newcastle and Gateshead, afterwards in London. Besides the countries above mentioned, we hear of cholera, during the year 1853, being in Hanover and Holland, and in numerous towns in the north of Prussia. Nor did the south-eastern and central parts of Europe escape the influence of this epidemic. Bessarabia, Moldavia, and Wallachia, besides the towns of Odessa and Jassy, were attacked in August and the latter part of the year. Piedmont, Barbary, and certain districts of Portugal were also affected. France was under the influence of the disease in the autumn.*

In London several deaths from this disease occurred "in September and October, while the temperature fell, and diarrhoea decreased from 723 in August to 283 in October; but during this time the cholera spread and became more fatal, so that the deaths from it were 335 in October and 228 in November, 43 in December, 1 in January, and another in February (1854). There were no deaths in March; only 4 in April, 4 in May, and 3 in June."†

New York and New Orleans were both invaded by epidemic cholera towards the close of the year 1853. Mexico suffered severely, and the disease was widely extended over the whole of the West India Islands.

* Dr. Gavin Milroy "On Cholera," *Medico-Chirurgical Review*, October 1865, p. 451.

† *Report of the Committee for Scientific Inquiry in Relation to Cholera of 1854*. London, 1855.

In 1854, cholera was reproduced throughout nearly every country in the Old and New World. Europe and America had never before been so terribly stricken by this fearful disease, for hardly a single province, and but few large towns, escaped its deadly influence.

Admitting; as I do, that this fresh outburst of epidemic cholera over Europe may have been connected with the epidemic of 1847-48, I am decidedly of opinion that it was mainly due to a fresh importation of the disease from Persia and Turkey, into which countries we have seen the disease had been imported from India in 1850, and was very virulent there in 1852-53. I am perfectly aware of the fact that the European epidemic of 1854 was weak in Russia, Poland, and the countries over which cholera had passed during the two previous years; nor is it possible for us to trace its course through Europe step by step as we did in 1831 and 1848 (and it may be we shall never be able to do this again); hence, as I have before remarked, the movements of the latter outburst of cholera had not completely died out before a fresh inroad of the disease took place from the east; the Indo-Persian epidemics of 1847 and 1853 were mixed up together in Europe in 1854, and produced the most deadly outburst of the disease yet experienced in the Old and New Worlds. In England the mortality from cholera during this year was 20,000; and in Scotland 6,848 persons died from cholera. In France some 140,000 were killed by the disease during this epidemic; and in Italy, cholera reached an unheard of pitch, in Sardinia for instance, no less than 45,000 persons were attacked

by the disease, and 24,000 of them died. In Bavaria the number of sick was 14,874, and of these 7,370 died. Besides this, cholera existed in Spain, Switzerland, Austria, Turkey and Greece.

In Persia, according to Gezer, the cholera was not so deadly in 1854 as it had been in the previous year. It appeared at Teheran at the end of September, that is, at the time when bodies of the dead were dug up from their graves with the view of being sent to the holy shrines. These were the bodies of those persons who died at Teheran from cholera in 1853, and the disease ceased as soon as the exhuming of the bodies was discontinued. Places through which the caravan carrying their bodies passed also suffered from cholera. Dr. Cloquet, physician to the Shah, states that in Teheran this was the sole cause of the malady in 1854.

During the year 1855 cholera was reproduced over the whole of Europe, a considerable portion of America, and the West Indies. In St. Petersburg and certain other parts of Russia it had almost become endemic, a remark, as we shall subsequently notice, equally applicable to Persia. Our troops, and those of Russia, in the Crimea, were again attacked by cholera in April, May, and June. It was generated over parts of Asia Minor, and Egypt. In France and Great Britain the disease continued to manifest itself in a few scattered localities.*

During 1857 and 1858 cholera entirely died out from the greater part of Europe and America.

In 1859 the disease again appeared in a sudden and mysterious manner in several places. It was generated

at Hamburg, in June, attacking "young and old, rich and poor, in all parts of the town, showing no preference for the waterside over any other locality." In July several towns on the Gulf of Finland were under the influence of cholera, and it was said to have been imported into the south of Sweden by a vessel from Rastock during the month of August. At the same time the disease broke out at Mercia, on the Mediterranean coast of Spain. The French troops in Algiers, and the Spanish army in Morocco, were severally affected by this scourge.

Cholera was imported into London and Hull from Hamburg in July 1859, but did not spread in either of these towns.

"In the summer, diarrhoea prevailed at the Woolston Coastguard Station from July 3rd to the 17th. On that day, S. Burt and T. Grant, assisted by five other men from the station, crossed the Southampton Water to Hythe, to assist in carrying to the grave one of their comrades, who was registered as having died of phthisis. The following morning, July 18th, Burt and Adams left home at four o'clock to go on board the cutter 'Harpie,' moored in the Southampton Water. Whilst on board, Adams was seized with violent cramps in the stomach, sickness and purging; Burt waited on him, and in an hour after was attacked with the same symptoms. They were brought home to the Woolston Coastguard Station at 8 o'clock, and were soon after seen by Dr. Maddox, who found Burt in the collapse state of Asiatic cholera. He died the following morning. Adams had choleraic diarrhoea, and recovered.

"T. Fielder, aged 69, staying with Adams, was found in the collapsed stage of cholera the same afternoon. He died in thirty hours.

"On the 21st July the families, consisting of forty persons, were placed under tents in an adjoining field. Adams's son, 10 years of age, who occupied the tent next the station, was said to have had a severe attack of diarrhoea on the 22nd of July. On the 26th Mrs. Adams was attacked with symptoms of cholera in the afternoon, and was perfectly collapsed at 1 a.m. the following morning. On the 30th, Mrs. Buzzecatt, who occupied a tent about 200 yards from the station, was reported to have choleraic diarrhoea; no collapse. Nearly all the inmates of the station had diarrhoea during the outbreak. The registrar, the collector of customs, the quarantine officer, and the dock master, all declared they had not heard of a single case of cholera in the locality during the summer." *

With reference to this case, Dr. Parkes remarks, that "the localized character of the disease looks very like a case of water poisoning, although the water is stated to have been good. I have been informed that the privies had overflowed, and the sewage ran over the ground and close to the houses, and caused offensive effluvia. I have also been told that it is probable the water was really impure, and was perhaps contaminated by the overflow of the privies."

* *The Outbreak of Cholera at Woolston Coastguard Station in 1859.* By J. King Sampson, Esq. Mr. Simon's *Eighth Report*. 1866, p. 422.'

At North Shields, a sailor boy was received into a lodging house from a steamer, which arrived from Hamburg on the 12th of August 1859. He had been ill some days with choleraic symptoms and died of cholera four days after landing. On the day before his death, a child of three years of age living in the same house and who had often been in the sick lad's room, was seized with cholera and died. On the following day a maid-servant who had devotedly nursed these patients was attacked with cholera, which carried her off in eight hours.

With reference to this case Dr. Babington remarks that on the assumption that there was no cholera in Shields before the arrival of this vessel from Hamburg, it affords positive evidence of communication by contagion which cannot be controverted by any number of negative results.*

From the time that the existence of cholera on the Continent was known, the English Government were fully alive to the necessity of taking active measures against the invasion of the scourge. All vessels arriving from suspected places, especially Hamburg, were watched for cholera cases; those vessels in which it was found to exist were isolated as far as possible. The sick were at once taken to the "Dreadnought," and the local authorities were furnished with Mr. Simon's admirable memorandum as to the proper method of dealing with such cases. Quarantine, however, was in no instance resorted to; in fact it was generally believed at the time,

* *Transactions of the Epidemiological Society*, vol. I, p. 12.

in the words of the Bavarian Commissioners' report on the cholera of 1854, that "measures with the object of preventing the importation of cholera into a country yet uninfected, or of stopping its extension from a place already attacked, by means of the interruption of communication and isolation, are inefficacious, impossible of execution, and injurious."* Griesinger gave an opinion to the same effect. Nevertheless, it is to be observed, that the disease had been very severe in the province of Mecklenburg-Schwerin, where a plan similar to that adopted in England had been resorted to with advantage. Of 42 instances, in which the first case had been at once isolated, and the employment of measures of disinfection adopted, in 35 complete success was obtained, and the epidemic did not develop itself.†

Isolated cases of cholera occurred in several towns of Great Britain in 1859, but in no locality did it assume an epidemic form, except at Wicks, a fishing town in Caithness, into which the disease was said to have been brought by means of old clothes; this assertion, however, was not fully substantiated. The town was immediately placed under the Nuisance Removal Act and the disease died out.

Another limited outburst of cholera occurred at Glass-Houghton, near Pontefract. A portion only of the village, inhabited by about 60 people, was affected; of these 30 were attacked and 12 died. "Dr. Simpson ascribed the outbreak to the use of water from

* *Constantinople Conference*, p. 750.

† *Idem*, p. 795.

a well polluted with fæcal and other noxious matters." *

After this remarkable recandescence of cholera in western Europe, as Mr. Netten Radcliffe remarks, the disease would seem to have disappeared from the Continent and Northern Africa; it ceased also to prevail in the western hemisphere.†

Before closing the history of the epidemic cholera of 1858-59 I purpose referring briefly to some of the incidents of the disease as illustrating the prevailing ideas regarding it. Varna and Odessa were known to be affected with cholera early in 1854, as well as the countries near the mouth of the Danube: it attacked the Russian and Turkish forces on either bank of this river. Later in the season the English and French armies were first affected at Varna, where, as I have already observed, cholera existed earlier in the year. Dr. Marroin, the chief physician to the French fleet, assures us that cholera effected its entrance into the Black Sea on the 13th and 14th of July, with the ships *Primaugult* and the *Magellan* from Gallipoli. The disease spread from these vessels to the army at Varna. The cases on board the French fleet in Baltchick Bay were by no means numerous till the 7th of August, when free communication was opened between the fleet and General Bosquet's division of the army, at that time ravaged by cholera. Two days afterwards

* *Transactions of the Epidemiological Society*, vol. I. p. 16.

† *Eighth Report of the Medical Officer to the Privy Council*, 1865, p. 361.

the disease broke out with extreme violence on board the ships. From the 9th of August the epidemic assumed great proportions ; in three days it attained its maximum of intensity, and terminated at the end of ten days.*

Dr. Linton informs us that the disease was said to have been imported into Bulgaria in the early part of June 1854 by a French vessel which arrived at Varna from Marseilles, bringing troops from Avignon, already under the influence of cholera. Several cases of the disease occurred on board the ships on their passage to Varna. From the time the troops landed from this vessel cholera spread progressively through the town and allied forces, attacking the French and Turks simultaneously, and afterwards the English ; no class of people, no description of locality, obtaining an exemption from it.†

In the English fleet it first appeared in the "Diamond," on the 16th of July, ten days after the arrival of a French steamer from Toulon, in which cholera was prevalent. "At the time of the outbreak of the cholera the population of the British fleet numbered 12,572 men. These men, all living under the same conditions, except in one particular, yielded 710 cases of cholera and 397 deaths. Of these cases in the gross, 91·26 per cent of the men attacked were supplied with water derived from

* *Cholera Conference at Constantinople*, 1866, p. 104. Calcutta, 1868.

† *Medical and Surgical History of the British Army in the Crimea*, vol. II, p. 47. Presented to Parliament by command of Her Majesty, 1858.

springs at Baltchick, a spot on which French troops had been quartered while suffering from cholera. The troops had washed their clothing at these springs, and the ground for a great distance around was saturated with their excreta. The remaining 8·74 per cent of the infected were supplied with water partly from Baltchick. Three other crews of vessels suffered from severe diarrhoea. Of these, two positively took in water from Baltchick, and the third probably so. In one vessel which used distilled water (water condensed from the steam of the engines), cholera broke out; on examination, it turns out that this water was passed to the tank through a foul hose pipe. In all the other ships supplied with distilled water not a case occurred. The officers in such ships as were attacked suffered in the proportion of 1 in 177, the men in the proportion of 1 in 16·29.

The comparative exemption of officers may perhaps be accounted for by supposing "that the men partook most freely of the infected water with which the ships were supplied without disinfecting it by heat. The officer took his wine, tea, or coffee; the sailor, his grog. That the disease did not become distributed amongst the crews by mere personal contact with the infected is proved by the fact, that in one ship several infected persons were removed, and there was not a case of communicated disease amongst those who received them." *

* Dr. B. W. Richardson "On the Propagation of Cholera," *Transactions of the Epidemiological Society*, vol. II, part ii, p. 425.

Cholera commenced in the British army in June; it increased in prevalence for three months and then subsided, disappearing entirely in February 1855. There were no cases at all among our troops in March; but it burst out again in April, and reached its culmination in June. From this date the disease declined slowly and irregularly.

Dr. Downes, of H.M.'s 97th Regiment, informs us that the troops in the Piræus were all perfectly healthy until the early part of July 1854, when a French steamer arrived from Marseilles with cholera on board. "Two cases were landed, and admitted into the French hospital at the Piræus. Asiatic cholera of a malignant kind now made its appearance and rapidly spread, and cases of the diseases occurred in various parts of the town." The disease continued to prevail from the 19th of July to the 26th of August, when it gradually ceased.* Greece, from her peculiar relations, had been able to isolate herself from the rest of the world in the epidemics of 1832 and 1849, and had been absolutely free from cholera. In 1854, being under exceptional circumstances, and occupied by a foreign force over which she had no control, cholera effected its entrance into the country. In 1865, this source of danger being absent, she again entirely protected herself from the cholera which was raging around her.

Surgeon De Lisle reports that the disease was introduced into Gallipoli by a French vessel from Mar-

* *Medical and Surgical History of the British Army in the Crimea*, vol. II, p. 47. 1858.

seilles on the 10th of July. On the 19th several cases occurred in a British hospital, situated in the track of communication between the French camp and the town. Another hospital, the position of which was more unhealthy, but in a retired quarter of the town, entirely escaped a visitation of the disease.*

The ambulance corps were brought much in contact with the sick, and "there was scarcely any portion of the army more cruelly assailed by cholera. The proportion of admissions and deaths in this small body of men far exceeded that of any division of the army."† No less than 86 per cent of those attacked by cholera died.

Although it is impossible to fix the date and circumstances of the advent of cholera in England in 1853-54, we may with advantage consider its progress in certain localities, as for instance in Newcastle, which suffered most severely during this epidemic:

The Tyne, as is well known, is a tidal river, and during its flow it carries up the sewage of Newcastle as far as Elswick, where, in 1863, the open culvert of the water company supplying the town was situated. A large drainage area at Whittle Dean had usually yielded water for the purposes of the company; but early in 1854, the supply from this locality having been partially cut off, the company took upon themselves to pump water directly from the Tyne at Elswick into the town; the inhabitants of Newcastle were there-

* *Medical and Surgical History of the British Army in the Crimea*, vol. II, p. 47. 1858.

† *Idem*, p. 53.

fore constantly imbibing water contaminated with the filth of their own dirty city. We can imagine what the nature of this drinking water was, when it is stated, that no less than two thirds of the population of Newcastle were without privies, and the filth accumulating in the streets was washed down into the river by the rain, and, as already explained, carried up in a diluted form to Elswick, to be re-distributed to the inhabitants of the town for domestic purposes. Supposing cholera to have existed in Newcastle, it is evident that the dejecta of those affected would very probably under these circumstances have found their way into the intestinal canals of the unfortunate townspeople; the more so, as directly cases of the disease occurred, the authorities betook themselves vigorously to washing out and flushing all the drains and dirty holes in the place, thereby increasing the chances of cholera fomes finding their way into the river to be consumed by the population. It is quite certain that the drinking water contained organic matter, for Dr. Thomson found it in abundance by analysis, and considered it probable that a portion of it consisted of human excrements. And Mr. Furness, during the height of the epidemic, exhibited a bottle of drinking water to the guardians of the city of "a most noxious quality." I may observe, however, in passing, that although this impure water was consumed from May till the end of August 1854, it had not up to that time generated cholera among the inhabitants of the place.

On the 29th of August a woman living at Bill Quay,

where cholera was known to exist, was attacked with diarrhoea. She proceeded to Newcastle by steamer, and the case was declared on the 31st of August to be one of cholera. On the first of September 3 deaths from cholera were reported in the town; and by the 9th Mr. Granger states the disease "was epidemic" in the city. On the 12th there were 59 deaths, and on the 15th no less than 140 individuals fell victims to the disease. In the mean time the scandalous proceedings of the water company had been discovered and on the 15th of the month the supply of water to the town from the Tyne was stopped. From that date the cholera began to diminish.* On the 25th the deaths had fallen to 75 per diem, and on the 30th to 16, after which not more than 4 deaths occurred on any one day.

A still more remarkable instance of the kind is Dr. Snow's well-known Broad Street case, which was one of a succession of partial local outbreaks of the disease, which have always been a marked feature of cholera, attributable by the majority of authorities at the time to "the localizing cause" plus an "epidemic or pestilential constitution of the season." †

It appears that among the sub-districts of St. Ann's, Golden Square, the mortality from cholera in 1854 was no less than 128 for every 10,000 persons, while the general cholera-rate of the metropolis was only 60 to the

* *Reports on the Epidemic Cholera of 1866 in England*, p. xxxiii.
By the Registrar-General.

† Dr. E. H. Greenhow "On Cholera," *Medico-Chirurgical Review*, 1857, p. 53.

same number. The district was not situated on a low level, nor were its inhabitants very poor; it had enjoyed a peculiar exemption from disease up to the time of the outbreak of cholera. *

A child who had been ill with cholera or choleraic diarrhoea for three or four days, died at No. 40 Broad Street on the 2nd September 1854, and it was ascertained that the child's fæces had been emptied into a cesspool situated only three feet from the well of the public pump in Broad Street, from which most of the surrounding people took their supply of water. It was further discovered that the bricks of the cesspool were loose, and allowed its contents to drain into the pump well.† On the night of the 31st of August cholera broke out among the inhabitants of Broad Street, the greater number of cases occurring on the 1st of September. On the following day the attacks fell from 143 to 116, and the day after to 44; by the 12th of the month it had almost subsided. Dr. Snow and the Reverend J. Whitehead investigated the circumstances of this case with the greatest care; nor have the facts they brought forward ever been disproved. These gentlemen affirm: "It was found that nearly all the persons who had the malady during the first few days of the outbreak, drank of the water from the Broad Street pump, and that very few who drank of this water during these days escaped having cholera."

* *Report of Committee for Scientific Inquiries into the Cholera of 1854*, p. 50.

† *Lancet*, vol. II, 1855, p. 456.

In the weekly return of deaths for September 9th, the following was recorded as occurring in the Hampstead district: "At West End, on 2nd September, the widow of a percussion-cap maker, aged 59 years; diarrhoea two hours, cholera epidemic sixteen hours." Dr. Snow was informed by this person's son that she had formerly resided in Broad Street, but had not been in the neighbourhood for many months. A cart went from Broad Street to West End every day, taking out among other things a large bottle of water filled from the pump in Broad Street, the lady in question preferring this to any other water. The bottle of water was carried out to Hampstead as usual on Thursday the 31st of August, and she drank some of it that evening, and more on the following day. She was seized with cholera on the evening of the latter day, and died on Saturday. A niece, who was on a visit to this lady, also drank this water; she returned to her residence, in a high and healthy part of Islington, was attacked with cholera, and died. There was no cholera at the time either at West End or in the neighbourhood. Besides these two persons, only one servant partook of the water at Hampstead, West End, and she did not suffer, or only to a slight extent.* On examining the Broad Street pump water, Dr. Snow found it to contain organic matter in the form of "small white flocculent particles," which, Dr. Hassall thought, "resulted from the decomposition of organic matters."

With regard to this remarkable case, the committee appointed by the Board of Health to conduct a scientific

inquiry into the circumstances of the epidemic of 1854, remark: "It seems probable that the water of this well did really act as a vehicle of choleraic infection; but (assuming the absence of fallacy in the case) this probability might easily be admitted, without its therefrom resulting that infection depended on the specific material alleged (by Dr. Snow). The water was undeniably impure with organic contamination; and we have already argued that if, at the time of epidemic invasion, there be operating in the air some influence which converts putrefiable impurities into a specific poison, the water of the locality, in proportion as it contains such impurities, would probably be liable to similar poisonous conversion."* The committee argue: If therefore the specific action caused by the Broad Street pump water be admitted as a fact, it did not arise from its containing the dejecta of those who had died of cholera, but because it had participated in the atmospheric infection of the district.

The committee had by no means neglected to investigate the state of the water consumed by the inhabitants of London during the epidemic of 1854. Dr. Thomson had furnished them with an admirable report and analysis of these waters, and Dr. Hassall had given them an equally valuable paper upon its microscopical appearances. He had found, in most of the drinking water, organic matter and living particles, but only of "species which are known, and which have

* *Report of Committee for Scientific Inquiries into the Cholera Epidemic of 1854*, p. 52.

been long since described in systematic works; and since the greater number of them are present in these waters at nearly all seasons, and since they are therefore constantly consumed, it is clear they are in no way concerned in the production of cholera." *

Nevertheless, it was shown that in two large sections of the population of London, "breathing the same atmosphere, comprising the same classes, and averaging the same habits of life," in the one class the death-rate from cholera was 130, and in the other only 37 per 10,000. The former, however, were supplied with water "impregnated with the sewage of the metropolis," and the latter with pure water. From a comparison of the mortality in the epidemic of 1849 with that of 1854, it appears that the population to which the Lambeth Company's water was distributed in the latter epidemic, suffered a mortality less than one-third of that sustained by the drinkers of the water purveyed by the Southwark and Vauxhall Company, and that the tenantry using the purer water supplied by the Lambeth Company in 1853-54 suffered not a third as much as the same tenantry had done in 1848-49, when the water was impure. On the other hand, the Southwark and Vauxhall Company, which pumped an impure water in 1848-49, pumped even worse water in 1853-54, and the mortality in the houses supplied was 10 per cent higher. † It was a consideration of facts such as these that led to the

* *Committee's Report*, p. 47.

† Dr. E. H. Greenhow, "On Cholera," *Medico-Chirurgical Review*, 1857, p. 71.

passing of "The Metropolitan Water Supply Act" in 1852, and which came into operation from the 31st of August 1855. Previous to this time the several water companies took water for domestic use from tidal and impure portions of the Thames, simply straining it through wire screens on its way to open settling tanks, from which it was pumped for use. By the Act of 1852 no company could draw water from the Thames below Teddington Lock; all reservoirs in which water was stored were to be roofed in, and on its way from any such reservoir to the mains or pipes for delivery, the water was to be filtered. The only exception to this rule was in the case of water which was pumped from wells into a covered reservoir or aqueduct, without exposure to the atmosphere.

The practical effect of this Act was to induce sand-filtration, and the supply of water from covered water tanks to the entire metropolis.

The Committee for Scientific Inquiries extended their investigation into the meteorological phenomena of the season of 1853-54, and their efforts in this direction were most ably seconded by Mr. Glaisher, of the Royal Observatory. The conclusions arrived at on this subject were: "1st, that 1854 and other years, when cholera prevailed, had their marked meteorological characters, the general tendency of which was to render the season defective in those atmospheric changes which renew the purity of the air; and 2nd, that these characters, apparently so definite in their meaning, are in their kind such as to prevail with greatly in-

creased development in those low levels of London, where all visitations of cholera have most cruelly pressed; for high barometric pressure, excessive night temperature, and hazy air, with absence of wind, of ozone, and of electricity, would all appear in their most marked degrees throughout those alluvial districts. And when these two statements are compared, it seems probable that, in the atmospheric conditions of the year (or some unknown influence essentially joined with them), there has been an important factor for the problem of that epidemic mortality.”*

After reviewing the whole of the materials at their command, the Committee were of opinion, as to the question of the etiology of the disease, that “the doctrine of epidemic cholera, which has gained almost universal acceptance, does not affect to explain what may be that power,—the exciting cause of the epidemic manifestation—which at intervals of time has forayed from place to place about our globe, sometimes vaguely spreading over a widened area, sometimes seeming to move in more defined procession, and which now for the third time has shed its fatal influence on our land.”

“But with this mystery still unsolved, there has grown more and more into shape a doctrine, which is both intelligible and practical,—that the undiscovered power in its wanderings acts after the manner of a *ferment*, that it therefore takes effect only amid congenial circumstances, and that the stuff out of which

* *Report of the Committee*, p. 34.

it brews poison must be air or water abounding with organic impurity. Taking this as hypothesis, and testing it by the facts before us, we find that it would include and explain them.

“Either in air or water, it seems probable that the infection can grow; but, on the whole evidence, it seems impossible to doubt that the influences which determine in mass the geographical distribution of cholera in London belong less to the water than to the air.” *

“Exemption from the mortality has followed more nearly the degree of elevation of the soil than been proportionate to any other general influence; and on the supposition (which this result greatly confirms) that the choleraic infection multiplies rather in air than in water, meteorology explains how the balance of healthfulness is weighted in favour of the higher levels, by their less participation in the high night temperature of the metropolis, by their comparative clearness from mist, and, above all, by the curative resources of more free ventilation.” †

Almost simultaneously with the publication of this report, the result of the labours of an International Sanitary Conference assembled at Paris, to discuss the whole subject of preventive medicine was given to the world, and the conclusion which the delegates from the various nations of Europe arrived at was in substance very similar to that held by Dr. Baly and Sir W. Gull. The Paris conference was of opinion that

* *Report of the Committee*, p. 48.

† *Idem*.

“hygiene, in its most extended sense, ought to be the true preservative of people against deadly pestilences which threaten them. Vainly will you seek to preserve them by isolation, sequestration, and the absence of all contact. You will fail, unless at the same time you do not prevent and destroy all foci of corruption and infection in ships and in dwelling houses. These foci are the real and all-powerful causes of the production of diseases; if they do not engender them fully formed, they so favour them, that without their aid the diseases either would not be developed at all, or be developed with difficulty, or would have little intensity, and rapidly extinguish themselves.

Starting from this datum, equally scientific and rational, and which cleanliness alone, in the absence of other considerations, would recommend, after determining that there should be no quarantine against cholera, because it cannot prevent it, we say—adopt measures of hygiene and cleanliness, introduce fresh air and plenty of it, disperse the people, and purify the buildings and merchandise.

We can hardly fail to trace in the above quoted *résumé* of the English report on cholera, the inimitable style of Mr. Simon,* reiterating the opinions of Drs. Baly and Farr, as expressed in the College of Physicians and Registrar-General's reports on the epidemic of 1848-49. It will be noticed how admirably the zymotic theory

*It is hardly possible for an Englishman writing the history of Asiatic cholera to mention the name of Mr. J. Simon for the first time in a work of the kind, without some mark of respect for one who has done more for preventative medicine than any man living. For some five and thirty years past Mr. J. Simon has been the leading and guiding spirit in all the great sanitary changes and legislation that has taken place in this country. It is almost impossible to estimate the amount of benefit he has conferred on England, and yet, beyond his own department, few of his countrymen know anything at all about him, or how deeply indebted they are to him.

and that put forward by the Collège of Physicians are interwoven, the combination being such as only a master hand could produce,* and yet the work was unsatisfactory, especially to the school led by Drs. Snow and Budd, and which at this time was extending its influence, and attracting the attention of many hard-working and thoughtful men, both in England and on the Continent.

Professor Pettenkofer, of Munich, in 1855, attributed the propagation of cholera to the rice-water stools of patients in a state of fermentation;† Pettenkofer believed in the necessity for the introduction of a ferment from without for the production of cholera, but was of opinion that this ferment can only act where it meets with suitable local conditions. According to this authority, a special leaven in the shape of the matter passed by a patient suffering from cholera, should it find its way into the ground, sets up a zymosis or series of decompositions in an impure soil and the poison of cholera is a miasm generated from this earthy fermentation. While, therefore, he considered the presence of a special ferment as essential to the production of a cholera epidemic, he also insisted upon the co-existence

* The committee from whose report I have quoted so freely was composed of the following eminent men: Drs. N. Arnott, W. Farr, W. Baly, and Messrs. R. Owen and J. Simon.

† These observations are copied from Dr. E. Hcadlam Greenhow's Review (in the *Medico-Chirurgical Review* for 1857, p. 66), of "Untersuchungen und Beobachtungen über die Verbreitungsart der Cholera, nebst Betrachtungen über Massregeln derselben Einhalt zuthun." Von Dr. Max Pettenkofer. München, 1855.

of certain local peculiarities. These he supposed to consist of a damp subsoil, sufficiently porous to be penetrable by the decomposition products of human and animal excrements. He was of opinion that it is only in such a soil, impregnated with this peculiar organic matter, that the special cholera poison is generated.

Hence, as Dr Greenhow observes, Professor Pettenkofer asserts the susceptibility or insusceptibility of towns for a cholera epidemic, to be in exact proportion to their soil relations. The difference between the mortality from cholera in the upper and lower terraces of London is attributed to the dry gravelly soil of the former, which allowed all the impure matters for decomposition to gravitate towards the moist closer soil of the lower levels, where it underwent a much slower decomposition. Single cases may occur, Dr Pettenkofer says, in towns or houses whose foundations are built on a rock, but never epidemics; and any exceptions to this rule will, upon closer examination, be found more apparent than real. Arguing from this presumed fact, he abandoned all ideas of air or water as the nidus of cholera, and sought for it in the soil alone.*

The ferment supposed by Dr. Pettenkofer to be necessary to set up the peculiar decomposition of which cholera poison forms one of the products, is the matter of the dejections of cholera patients. His notion was that the cholera-germ-bearing excrement, which spreads itself in the damp porous soil already impregnated with

* Dr. E. Greenhow "On Cholera," *Medico-Chirurgical Review*, 1857.

æcal matters, produced, by means of the fine division which it there underwent, such a modification in the process of putrefaction and decomposition, that, in addition to the gases usually formed, a cholera miasma was produced which became diffused through the atmosphere of dwellings in common with other exhalations. Thus, although the cholera miasma was formed in the ground, the air was the vehicle for its transmission to the patient. He considered the dejecta of persons suffering from diarrhoea or cholera equally capable with the cholera dejections of producing the pestilence.

In confirmation of his theory, Dr. Pettenkofer gives the following history of the introduction of cholera into the convent prison of Ebrach, where both the male and female prisoners were attacked, whilst the officials, a company of soldiers quartered there as a guard, and the inhabitants of the adjoining village entirely escaped. In the first place, however, we may notice that the "necessary" accommodation of the prison consisted chiefly of wooden night stools.* Such privies as existed for the use of the prisoners emptied themselves into a stream which, entering at the women's division, ran through the institution and passed out at the men's side. The privies in the female division were thoroughly bad, the brickwork through all the floors being impregnated with excrement; "the stink was a pestilential one," and the excrements were conveyed from the privies to the ditch by means of wooden spouts, passing close to the entrances of the working or sleeping rooms. Into this very objectional jail a prisoner was brought on the

20th of August suffering from diarrhoea, which soon became developed into cholera. On the 27th the man who attended him was taken ill with cholera and died. An epidemic spread through the jail, affecting the male and female divisions equally, although there had been no intercommunication between them, except through the officials of the place, all of whom remained free from the disease. But among the females it was discovered that the first case occurred in a woman who had washed the linen of the patient admitted into the prison with cholera.

There were 600 male prisoners, arranged in classes, between which there was little communication, yet the disease showed itself speedily throughout all parts of the prison, reached its climax in the men's division on the 11th of September, in the female on the 13th, and then declined, having carried off about 10 per cent. Dr. Pettenkofer attributed the outbreak to the fermentation set up in the excreta brought into the jail by the first case, and which were thrown into a large cesspool in the garden, and the badly arranged "necessaries" of the women's department, into which all their dejections were emptied.

The same author also mentions the fact of cholera having been introduced into the prison of Kaisheim in 1854 by two prisoners. Nothing could have been worse, he says, than the hygienic state of this jail, but the stools of the cholera cases and all others were subjected to disinfection, and not a case of cholera occurred among the other prisoners.

The same results were observed at Traunstein, in Bavaria, when sulphate of iron was employed as the disinfecting agent, and the disease in every instance contented itself, contrary to its usual habit, with the first victim.* In England Dr. Budd used similar means, and with admirable effect, to stop an outbreak of cholera at Horfield Barracks, near Bristol. He recommended that the dejecta of all the patients should be received into vessels containing a strong solution of chloride of lime; that the soiled linen should be burnt, latrines disinfected, the troops be kept under constant observation so as to catch the disease in its first stage, and, lastly, that the men should be prevented from wandering from their barracks into infected localities.

The above are a few among many cases of the kind recorded during the epidemic of 1853-54, not only as evidence of the value of disinfectants in cholera epidemics, but as proving the direct influence exercised by cholera dejecta in causing the spread of the disease.

Another class of cases occupied the attention of several observers during the epidemic of 1854, from which it was intended to demonstrate, not only that cholera (A.) might be communicated from sick to healthy people through means of choleraic evacuations, but that clothes or linen soiled with dejecta of the kind were capable of retaining the poison of cholera for a considerable time.

I have referred to a case in point related by Sir J. Simpson, which occurred at Moor Monkton in 1832.

* *Constantinople Cholera Conference*, p. 44. Calcutta, 1868.

In 1854 cholera was not known in the county of Bedford when it broke out in the village of Ridgmount, and eleven cases occurred, all of which were fatal. It was ascertained that the first case occurred in a man whose son had died of cholera in London a week or two before, and whose clothes were sent down to the country. The poor man unwrapped the bundle of clothes himself, he was seized with the disease and died. His case was the nucleus of the others.* An instance of a similar nature was reported from Lustheim near Munich, where the first case of cholera was generated in the house of a labourer one of whose daughters was in service in Munich. The latter sent her parents clothes belonging to a family some members of which had just died of cholera; these old clothes were at once appropriated and worn: three days afterwards (September 21st, 1854), the father and mother were seized with cholera and died; on the 22nd and 25th other members of the family took the disease.

Dr. Lebert reports the case of a man who was attacked with cholera, having worn the clothes of a person who had died of the disease two months previously. Other instances are cited of persons having been seized after sleeping in beds previously occupied by cholera patients, but which in the mean time had been kept locked up.†

In the neighbourhood of Tavatola the wearing apparel, the bed-clothes, and the mattress of a cholera

* *On Malaria and Miasmata*, p. 140. By Dr. J. Barker, F.R.S. London, 1863.

† *Constantinople Cholera Conference*, p. 95. Calcutta, 1868.

patient were washed at one of the fountains of the city ; the waste pipe of the fountain being broken, this foul water became mixed with the drinking water. On the following day sixty persons in this small and up to that time healthy district were stricken with the malady.*

* Dr. B. W. Richardson "On Cholera," *Transactions of Epidemiological Society*, vol. II, p. 427.

CHAPTER VIII.

THE EPIDEMIC CHOLERA IN INDIA OF 1855-56, AND ITS PROGRESS INTO PERSIA, ARABIA, AND AFRICA.

DURING 1853 cholera (A.) hardly existed beyond its endemic area; the Punjab epidemic of 1852 having been reproduced to a very limited extent, as, for instance, in the Kumaon local battalion. In the Benares division, cholera was met with for a few days, during which time many were seized with it; but in the Cawnpore, Agra, and Meerut circles, there was not a single death from cholera among the European troops throughout the year.

The 2nd Bengal European regiment started from Agra in a fleet of country boats for Calcutta, in January. Dr. W. Anderson informs us, that the weather was very hot for the time of year, but that the men were all remarkably healthy until they came near Dinapore, where they met the Sikh regiment of Ferozepore, "in which, at the time, cholera was committing dreadful ravages." Means were taken to prevent communication, if possible, between the regiments; but those who have travelled in these straggling fleets of country boats on the Ganges, can best judge how impossible it is to prevent the camp

followers under these circumstances from having intercourse ; however this may be, of one thing we are quite certain—from the day the uninfected European regiment passed the Sikh infected corps, cholera appeared among the men of the former regiment, and continued to spread until they arrived in Calcutta.*

During the year 1853-54 cholera was “partially epidemic” among our soldiers in Burmah ; at Kyook Phyoo, and other parts of Arracan, it carried off numbers of the civil population.

From Assam, Dr. C. B. Francis reports the following circumstances : On the 20th of April “a party of 28 sepoy started from Gowhatty (which was at the time free from cholera) for Gawalparah ; on the road they stopped at Palasbaree where the disease was very bad. Immediately afterwards one of the party was seized with cholera, and on their arrival at Gawalparah, cholera was generated among the sepoy of the regiment who up to this time had been absolutely free from the disease.” Later in the year, cholera was prevalent in many parts of Assam, Cachar, and Sylhet. At Dacca, it was very severe in July, November, and December, being of a “decidedly epidemic character.”

In the jails of Bengal Proper, the average number of prisoners for the year amounted to 20,535, and 1,376 cases of cholera occurred among them.

Cholera was epidemic in the Dinapore circle, and, as usual, was more severe among the European than the native troops.

* MS. Proceedings of the Medical Board for 1853-54.

Dr. Guthrie reports from Benares : "Cholera appeared in the month of June ; the peculiarity of this visitation was its fatal type—patients, getting over the first stage and giving every hope of recovery, after a time dying from debility and exhaustion of the nervous power. Its fatality was much greater among the Europeans than natives. It prevailed chiefly at Secrole and Chunar." Drs. J. Wilkie and Bonsfield report the circumstance of cholera having been most fearfully prevalent at Lucknow, and generally throughout the province of Oude. Information to a similar effect was received from Azimghur and Mirzapore. Dr. D. Butter, states that, "in April 1853 a detachment of 341 strong left Chittagong, under Captain Bird, of the 11th Native Infantry. When in progress by water to Allahabad, they were attacked on the 12th of the month by cholera, near Chunar, where Captain Bird disembarked, and, leaving the sick to come up the river in the boats, he marched the remainder of his men to a place opposite Allahabad. On the 19th four cases occurred in this party ; they were next day brought over the river and placed in the regimental hospital, within seven days, 30 cases were admitted from among the sepoys, and 23 died. Up to the 28th, 49 cases had occurred and 31 died. No admission took place after the 25th, and no cases occurred in the neighbourhood, except among the men of the detachment and the camp followers. In July cholera again visited the regiment, but it was very severe at the time in the surrounding country." "The 65th Regiment, proceeding by water to Calcutta in November,

was absolutely free from cholera until passing Cawnpore, where the disease existed; the sepoy's were then and there attacked with cholera, and their medical officer died of the disease."

The superintending surgeon of Cawnpore remarks that, "during the year 1853 both European and native troops suffered from cholera, especially the former (among whom there were 261 cases, and 184 deaths); but that this mortality was as nothing in comparison with that of the villages in the surrounding districts."

I find, among the proceedings of the Medical Board, reports from officers in almost every station from Agra to Peshawur, and away down into Central India; and, without exception, they all affirm, that cholera did not make its appearance among those under their charge during the year 1853.

We have, therefore, evidence to prove that cholera was generated throughout its endemic area in Lower Bengal in 1853, and advanced steadily to the North-west, to about as far as the Cawnpore circle, but not beyond it; and I may here remark that up to this period there were no railroads open in India—the ordinary method of travelling from the lower to the upper provinces was either by marching, or else by country boats or steamers along the River Ganges.

During the following twelve months (1854), the disease did not extend itself into the North-west and Punjab, as we might have expected; on the contrary, the whole of this presidency was remarkably free from cholera. In Bengal proper the number of cases was about half as

numerous in the jails as in the previous year, and our troops suffered in even a smaller proportion.

In 1855 cholera was again limited to its endemic area in Bengal. The number of cases among the prisoners however in this province had increased to 1,015. But, in examining these jail returns, we are struck with the remarkably localized action of the disease. For instance, in the Patna jail, where the average number of prisoners during 1855 amounted to 596, there was not a single case of cholera; whereas, in the next station, Arrah, within thirty miles of Patna, of 537 convicts, 127 were seized with cholera. On the opposite side of the Ganges, and almost within sight of Arrah, is Chuprah; in this jail, among 629 prisoners, there was not a single instance of cholera. In the Dacca jail, there were 239 cases of the disease; but in the next station, Furreedpore, not a single instance of it occurred.

I first met with cholera in India in 1855, being then attached to the First Bengal Fusiliers, at Dinapore; the disease broke out in the regiment in May. Within the course of a few days we had twenty-nine cases and eleven deaths in the regiment from cholera; during this time I slept in the hospital among my patients, and hardly ever left the cholera ward. It seemed as if the disease had laid its hands on some of the finest and best soldiers in the regiment; and to see these poor fellows carried off one after the other by this terrible malady, away from home, friends, and with only native servants as nurses, all tended to make so vivid an impression on my mind that I have never been able to overcome it, and the

result has been the deep interest I have subsequently taken in all matters bearing on the circumstances of this frightful disease. Cholera appeared soon afterwards in an epidemic form at Chumar, and in Benares; it was very fatal at Goruckpore and along the Nepal frontier.* It did not break out to the west or north-west of these localities during the year 1855, but the following twelve months, as I shall proceed to show, it was generated with terrible force over the whole of the North-western provinces and the Punjab.

With the exception of an outbreak of cholera in a wing of H.M.'s 53rd regiment, stationed in Fort William, I find no special mention of the disease in Bengal Proper during the year 1856, unless in a sporadic form, in the Barrackpore, Dacca, Dinapore, or Benares circles, and to a very limited extent only in the Cawnpore division, where eleven men of the 1st Fusiliers were attacked by cholera early in the season: in the report, giving the details of this circumstance, it is expressly stated that the disease was not epidemic in the station.

On the 21st of May, the weather being very hot indeed, cholera broke out among the natives in the city of Agra. On the 25th of the month, three men, at the time actually suffering from the disease, were brought into the hospital. "Five days after this, viz., on the 30th of May, the disease appeared in the jail," and did not cease until it had attacked 349 prisoners. Prior to the introduction of cholera among the convicts, a number of them had

* *Report on the Attack of Cholera in the Central Prison at Agra in 1856*, p. 3. By Dr. John Murray. Agra, 1856.

been removed to Secundra; they remained free from cholera, with the exception of two cases. On the 12th of June, the disease having assumed fearful proportions in the jail, the convicts were ordered out of it, and a party of them sent among the men at Secundra. On the 16th, the disease broke out among the Secundra convicts, and rapidly increased till the 21st, when the prisoners were recalled and sent into tents on the Poyah Ghat Road, "where the cholera rapidly declined, the tents being shifted from one spot to another whenever any fresh instances occurred among the convicts. The total number of cases among the Agra prisoners in 1856 amounted to 564, and of these 230 died." *

During the month of June cholera was generated in numerous localities round Agra. In July it had extended to Etawah, Furrucabad, Bareilly, and Delhi. In August, Gwalior to the south, Nainè-Tal to the north, Lahore and Ajmere to the west, were invaded by the disease, the majority of towns, and even villages, within this area were at the same time under its influence.† The disease extended as far west as Mooltan. And it travelled down its appointed course through the Central provinces, the Bombay Presidency, and the Deccan, invading the Madras Presidency in the usual way.‡

* Dr. J. Murray's *Report*, 1856.

† *Report on Cholera in the Meerut, Rohilcund, and Ajmere Divisions in 1856.*

‡ *Cholera in India*, p. 15. By Surgeon W. R. Cornish. Madras, 1871.

Numerous instances are recorded, in the reports of 1856, by the various medical officers of the North-west, of the remarkable manner in which the disease settled on certain spots, often sparing those around in a most mysterious manner. Mr. Edwards, the magistrate of Seharumpore, remarks: "Its sudden appearance without any visible cause at isolated points, and its immediate fatality might be likened to the seeds which a bird drops in its flight, and which germinate where they fall. The amount of rain, or the direction of the wind, did not appear to affect it. It was hoped that, on the 8th of September, when the wind changed from east to west, the disease might diminish, but the number of fatal cases, on the contrary, increased."* At Meerut, a well-drained and healthy place, the ravages of the cholera were very great; whereas at Seharumpore, a peculiarly dirty city, comparatively few people suffered. In the latter place, the jail and stud lines wholly escaped the influence of the disease.

Dr. Boyd, of H.M.'s 32nd Regiment, states that cholera was imported into Kolka, a station on the Himalaya 7,000 feet above the sea, by the hillmen returning from the fair of Thunnesir, where the disease was known to prevail. These hill-people carried the cholera with them into their villages, and spread it as far north as Simla. The 32nd Regiment remained free from the disease at Kolka, but having been ordered to march to Lucknow, the men were attacked by cholera within two marches

* *Report on Cholera in the Meerut, Rohilcund, and Ajmere Divisions, in 1856.*

of Thunnesir, and it clung to them until the 27th of November.

The soldiers at Dugshai, another of the Himalayas stations, entirely escaped, although the surrounding hill country was ravaged by the disease.

Dr. C. M. Smith reported from Lahore, that cholera appeared at Mean Meer on the 6th August, and spread through the cantonment; among the European troops, with a total strength of 1,592 men, there were 495 cases of cholera and 265 deaths.

On the evening of the 16th of August, a prisoner was admitted into the central jail hospital at Lahore, suffering "from diarrhoea of a choleraic character." On the 20th and 21st unmistakable instances of cholera showed themselves among the convicts; and within the following month 367 cases and 183 deaths from the disease were reported as having taken place in the jail. The prisoners were then removed into camp with the most beneficial result. "The spirits of the prisoners, which were before depressed, revived, and their thankfulness and gratitude were displayed, not only in expression, but by their orderly and good behaviour; no attempt at escape or *meute* was even thought of." * Dr. Smith gives carefully compiled tables of the duration of each prisoner's illness. In two instances only did the patients sink within five hours from the time of being attacked by cholera, and in by far the majority of cases they were under the influence of the disease upwards of 12 hours before they died.

* *Report on Cholera in the Meerut, Rohilcund, and Ajmere Divisions in 1856.*

Dr. Smith confirms the fact mentioned by Dr Murray, that more rain had fallen in the Punjab during 1856 than had been known for many years; in fact the country was inundated with water.

The epidemic did not extend into the Peshawur circle, for Dr. Ransford states that none of the troops under his supervision were affected. He observes, however, that "in October and November some cases of fever assumed a very severe form, and occurred in men who had had frequent attacks in barracks before coming to the hospital for treatment. They were suddenly seized with purging and vomiting, accompanied by cramps in the hands and legs; the matter passed by stool was at first fæcal, rapidly became bloody, and sometimes consisted merely of pure blood mixed with a little mucus. These cases were generally admitted into hospital in a state of collapse. In some instances there was no secretion of urine; the features were shrunk and lips livid. These cases, if not cholera, so nearly resemble it, that many medical officers return them as such; but though the symptoms were very alarming at first sight, every case got well unless complicated with disease of the liver."* It is very necessary indeed to bear these facts in mind, for I have no doubt that in many parts of India cases of this kind, which are doubtless due to malaria poisoning, have been attributed to cholera. The following observations of Dr. W. Rean, senior medical officer at the Andaman Islands, fully illustrates this idea. He writes—

"The cases to which I refer happened in some patients

* Proceedings of the Medical Board for 1855-56.

who came under treatment at the end of the year, and had peculiar features which gave them a great resemblance to cholera. The patients were generally admitted from some very feverish locality, or had been employed in works of an unhealthy character. They were taken ill somewhat suddenly; the most urgent symptoms being frequent purging and vomiting with great prostration. The alvine evacuations bear a resemblance to curds mixed with bloody serum, and the vomited matters were a light coloured watery fluid; the countenance pinched, voice hoarse and husky, tongue pale, and breath cold, the extremities of the fingers and toes puckered, pulse not perceptible, and the surface of the body cold and clammy. The patients suffered from cramps of the stomach and extremities, and had great thirst; respiration was much restrained, causing extreme anxiety and a presentiment of approaching death; in most cases the urinary secretion was suspended. The only diagnostic sign to distinguish the disease from cholera was the character of the stools, and they sometimes approached the conjee-like character of choleraic evacuations. Until I have seen one of the patient's stools, I could in no way distinguish the disease from cholera, and had a patient died without passing any evacuation, I should have unhesitatingly ascribed the death to spasmodic cholera. After a few cases had come under observation, the nature of the disease was clear; in fact the rapid recovery of the patients (for only a few died), soon averted the attention and dispelled any misgiving I had about the character of the complaint. There are scarcely any marked stages in this type of fever, as in

other varieties of the disease. It begins with the phenomena of collapse and ends in re-action or death ; it is marked by continued cold till re-action sets in, and brings warmth to the skin and force to the pulse, which may determine severe head symptoms, or a critical sweat may restore the patient to convalescence. The re-action from this type of fever bears a complete analogy to the same condition in cholera. There appears to be no relapse—the patient gradually recovers from the great debility induced and returns to his occupation. It is not contagious. The treatment should be prompt and active : first to restore the heat and combat the asthenic character of the disease by hot fomentation, rubefacients and diffusible stimulants, control the vomiting by effervescing drinks or other means, and check the purging by opiate and emollient injections and astringents, and as soon as possible give quinine in moderate doses, to be frequently repeated.”*

While cholera was extending during the year 1856 over the North-western provinces of India, it was committing terrible havoc among the inhabitants of Nepal.

Dr. Leith informs us, in his “Mortuary Report” for Bombay, that, from the aggregate of the last nine years, it was found that cholera was in excess in eleven districts in 1856, the preponderance of mortality from this cause being in localities lying along the sea shore.

In 1857 cholera showed itself in the north-east of

* *Medical and Sanitary Report on the Settlements of Port Blair, Andamans*, 1870. By W. H. Rean, M.D., Senior Medical Officer, Port Blair.

Persia. I simply mention this fact in connection with the spread of the disease over the North-west of India and the Punjab in 1856 ; but the relation, if any, which existed between the cholera of India and Persia during the time under review cannot now be determined. It is, however, noteworthy, that from 1851 until 1861 the disease appeared in various localities in Persia, year after year. We have already noticed the facts connected with the history of the disease in Persia during the years 1851-52-53-54.

M. Bartoletti informs us that in 1855 the inspector announced on the 17th October that cholera had shown itself at Teheran. This information was confirmed by the British consulate. Later it reached Tabreez. In the month of October 13,493 pilgrims underwent quarantine at Khanequin, and on the 13th November the disease showed itself at Hamadan. On the 28th November the Mecca caravan arrived at Imam Ali in good health, although it had been attacked by cholera *en route*.

In 1856 cholera ravaged Recht, the capital of the province of Ghilan, near the Caspian Sea. On the 6th October it had reached Teheran. On the 17th September it showed itself at Ispahan, Hamadan, Kermanshah. On the 10th October 3,600 pilgrims were in quarantine at Kanizithich, and amongst them there were from eight to ten cases of cholera daily. They concealed their corpses, which they cast into the desert and into the Djala. They also concealed their sick among their baggage on the appearance of the health agents. They broke the quarantine, many hundreds flying through the

Diala, who were brought back by the Bashibazouks. Cholera showed itself at Bagdad, it ravaged Kermanshah. The quarantine was broken through forcibly; 5,000 pilgrims, decimated by cholera, threw themselves upon Bagdad, followed by other caravans stricken with the scourge. They threatened to enter the town, and it was found necessary to repulse them *vi et armis*. The disease carried off 58 victims at Bagdad in the space of a month, and at Kerbelah there were from 25 to 30 deaths daily. The entire course of the Euphrates was infected; at Bassorah there were from 30 to 35 cases of cholera every day.

In 1857 cholera showed itself in the north-east of Persia and spread to Shiraz. The report states that cholera was imported every year by the caravan of pilgrims from Persia. A fresh invasion was apprehended at Bagdad, and the epidemic did in fact break out there on the 16th October. On the 22nd it was at Kerbelah and Imam Ali. There were 1,000 deaths at Kerbelah and 394 at Imam Ali; 91 at Bagdad.

Beyond this, I am informed by Dr. Fagergren, in charge of the province of Fars, that during twenty-two years cholera had appeared three times in the district; the most virulent outbreak of the disease was in 1857, when not only the inhabitants of the sea-coast, but those of the interior, were under the influence of the disease.*

In 1858 the disease existed at Teheran and at Koum, on the Teheran road: at Mohammerah it carried off 38 victims daily. On the 13th October the disease

* Letter forwarded to me from Dr. Fagergren by Lieut. Lovett, R.E.

spread to Bassorah, where in a few days it carried off 30 persons.

In 1860 cholera invaded Persia in the beginning of November, and on the 19th December it raged with violence at Kermanshah. On 6th December it arrived at Bagdad, where 4 deaths took place between that date and the 19th.

In 1861 cholera was very severe at Kermanshah, and appeared at Teheran in the month of January. On 31st July 80 cases daily were reported at Hamadan. On 28th August it appeared at Kermanshah, where according to what it is asserted (perhaps without any foundation for the assertion) there were 300 deaths a day out of a population of 25,000 souls then greatly reduced by emigration. On the 19th September a mortality of 250 persons in 19 days was reported at Mandeli, twenty-five hours' journey from Bagdad; then at Bokouba, 9 hours' distance from Bagdad, 10 cases a day in a population of 4,000 souls. The report of the 19th October of the same year announced that cholera existed in Persia and at Bagdad, at Imam Ali and Kerbelah. On the 13th December it showed itself at Imam Ali, where it lasted for a month, 30 persons dying daily during the height of the epidemic. At Kerbelah there were 427 deaths during the month of December.

From 1861 to 1865 there was no further epidemic in Persia. But I would here draw particular attention to the fact of cholera having existed more or less constantly in Persia from 1851 to 1861, as bearing upon a remark I made to the effect, that throughout the same period

the disease had become endemic in certain parts of Russia.

In 1858 many places along the Arabian coast of the Red Sea were again subjected to this terrible scourge "at Mecca, Lohea, Hodeda, and Mocha; it was also very prevalent at Massowah. From these ports, buggalows, with goods of merchandize, were continually arriving at Aden. A ship also anchored in the harbour from Mecca, bringing a large number of pilgrims; two had died of cholera as the ship approached Aden. From these facts, it is very probable, nay even almost certain, that the poison of cholera was imported into Aden from some of the neighbouring places." *

Sub-Assistant Surgeon Ruttonjee Hormusjee, who was at Aden at the time, adds that with the exception of cases of epidemic cholera which had occurred in the station in 1845, the disease was absolutely unknown in Aden until the 29th of September 1858; it then increased rapidly, and in three or four days it attained its greatest severity. About the 8th of October the number of cases began to fall, and the disease itself showed a more amenable character; and after the 28th of the month no fresh cases occurred. "After the epidemic broke out at Aden, it made its appearance at Lahadge and Berbera, so that certain ports on the Red Sea, carrying on a regular trade with Aden *via* Mocha, Hodeda, Jedda, Lohea, suffered from cholera first of all; the disease appeared next at Aden, whilst Aden itself communicated freely with Lahadge and Berbera, where the disease was last seen."

* *Transactions of the Medical and Physical Society of Bombay* for 1859, Appendix, p. 33.

Dr. James Christie, of Zanzibar, has given us further valuable information regarding the course of this epidemic along the east coast of Africa; he observes that this epidemic, like the first, appeared in the months of December and January 1858-59, during the strength of the north-east monsoon, and it was also first heard of in the Somali ports of Mukdesha and Brava. It may be necessary to mention that from December to March the wind blows steadily from north to south, and from June to October from south to north, the former period being called the north-east monsoon, and the latter the south-west monsoon. During the strength of the north-east monsoon there is rapid communication between north and south, but none from south to north, and *vice versa*. The epidemic therefore being present at the northern part of the Zanzibar dominions at the setting-in of the northerly monsoon of 1859-60, at the very time that communication towards the south was opened, it passed rapidly in that direction, desolated the coast towns and the populous islands that fringe the coast, extending as far as the Portuguese settlements at Mozambique. Dr. Kirk, who was at that time stationed at the Zambezi, in connection with Dr. Livingstone's expedition, states that it stopped short of that district. This was probably owing to the change of the monsoon arresting communication farther south than Mozambique. General Rigby, who was then H.M. consul and political agent at Zanzibar, states that many of the coast towns were almost decimated, and that in the town and suburbs of Zanzibar the mortality was from 7,000 to 8,000, and in the whole island

about 20,000. During this epidemic very few natives of India died, only three or four, although at that time they were more closely mixed up with the slave population than now. The mortality amongst the Arabs was much greater than during that of 1835-36, but the native population, especially the slaves, suffered most. The epidemic spread inland from several of the coast towns, but its range was limited, and no great mortality was heard of in the interior. It did not remain long in the island nor on the coast.*

I have above noticed that cholera appeared at Mecca in 1858, and it was much feared that it would have travelled with the pilgrims to Damascus; on arrival there, however, the caravan was found to be absolutely healthy.

In 1859 the disease was reproduced at Mecca, and the mortality in the caravan was very great; but again the salutary influence of the desert seems to have entirely destroyed all traces of the disease, for the pilgrims arrived at Damascus on the 10th of September in perfect health.†

From these historical facts it is evident that cholera spread over the whole of northern and western India in 1856, it appeared in the north-east of Persia in 1857, and over a very considerable portion of the country in 1858, where in fact it had broken out annually for the previous eight years. At the same time cholera was spreading along the shores of the Per-

* *Lancet*, vol. I, for 1871, p. 114.

† *Constantinople Conference*, 1866, p. 392.

sian Gulf and the Arabian shores of the Red Sea into Africa.

Nor must we pass over the fact, which is evident from Dr. Leith's Mortuary Returns for Bombay, that cholera was never absent from the island for a single season from 1850 to 1860. Dr. Leith says there was no "regular annual time of its maxima and minima, and in looking over the returns of the successive years, the outbreaks or exasperations of the disease, as indicated by the deaths, are seen to have taken place at apparently irregular periods."

The number of deaths from cholera registered in the island of Bombay were as follows :—

In 1851	.	.	.	.	4,020
1852	.	.	.	.	1,135
1853	.	.	.	.	1,339
1854	.	.	.	.	3,353
1855	.	.	.	.	1,739
1856	.	.	.	.	2,151
1857	.	.	.	.	1,741
1858	.	.	.	.	105
1859	.	.	.	.	2,285
1860	.	.	.	.	1,687
1861	.	.	.	.	1,251

If, therefore, cholera spreads from certain parts of India to Europe *via* Persia, or Arabia and Egypt, we find in the history of the disease in Bombay, during the ten years ending in 1860, evidence of a source of the disease quite sufficient to account for its presence in these countries, which I need hardly say are in constant communication with Bombay. In addition to

this, within these ten years we have traced two vast waves of the disease from Bengal over the north-west of India into the Punjab, and corresponding outbursts of cholera in the north-east of Persia, Arabia, and Africa.

Cholera had broken out in the Mauritius in 1854. It was said at the time to have been introduced into the island by the ship "Sultany," which arrived from India with coolies on board; but, as I have no detailed history of this cholera, I may probably pass on with advantage to the consideration of the epidemic in the Mauritius in 1856, of which we have fortunately full particulars, the governor of the island having at the time summoned a commission to inquire into and report upon the circumstances of the outbreak.* From this report we learn that two vessels, the "Hyderee" and "Futtay Mombarrack," arrived at Port Louis from Calcutta, on the 5th and 8th of January 1856, having 632 coolies on board. During the passage, deaths from cholera had occurred on the "Hyderee," and probably among the crew of the other vessel. On arriving near the Mauritius they were visited by the health officer of the island, and in consequence of the sickly state of the crew, the vessels were prevented from proceeding to Port Louis and ordered into quarantine. They were kept at anchor at the Bell Buoy from the 14th to the 16th of January; the coolies were

* *Report of the Committee appointed by his Excellency the Governor to Inquire and Report on the Probable Cause of the Recent Outbreak of Cholera in the Island of Mauritius.* Port Louis, March 1856.

then landed on Gabriel Island, the quarantine station of the Mauritius. On the 17th Dr. Finlay went from Port Louis to take charge of the coolies, and on arrival he reported that after they landed two deaths from cholera had taken place among them. Within the following month no less than eighty-three of the coolies died from cholera.

Close to Gabriel Island is Flat Island ; between the two communication was at all times easy by boat, and on foot at low tide. It was clearly shown that intercourse had taken place between the two islands after the landing of the coolies. On the 12th of February the wife of the lighthouse keeper of Flat Island was seized with cholera and died.

The coolies on Gabriel Island were permitted to go to the beach, and remove the casks of water and provisions sent to them from Port Louis, nor were effective means taken to prevent their communicating with those who landed the stores on the island.

A creole of the name of Alfred, who had from the first been employed on the contractor's boat, and whose duty it was to carry stores from the boat up the beach of Gabriel Island, and who was thus employed on the 20th, 23rd, and 26th of February, was taken ill on the latter day and, as the steamer "Victoria" was returning to Port Louis, Alfred was put on board. On his passage, symptoms of cholera declared themselves, and he died on the steamer the same night (26th February) of cholera. This was the first case of cholera in Port Louis. The crew of the "Victoria" were allowed to land, and were

soon dispersed throughout the town. "A few days afterwards cholera broke out in Port Louis, only to cease after sacrificing in the Mauritius thousands of victims." "A portion of Savanne was attacked at the very commencement of the epidemic, which had evidently been introduced into the district by a prisoner arriving from Port Louis, about the 8th of March, and who was attacked with cholera on his journey. On his arrival at Savanne, the disease spread among those who were in contact with him, or near him. It was the same in all other districts of the island, where the disease always first appeared in persons who had come from Port Louis." The Commissioners appointed by the governor of the island, to inquire into the origin of this terrible outbreak, further observed, that they had no scientific opinion to give as to the cause of the disease ; in fact, it was not their province to do so ; but they expressed their deliberate opinion "that it was impossible to arrive at any other conclusion respecting the appearance of cholera in the Mauritius, in the month of March 1856, than that it was introduced from Gabriel Island by the steamer 'Victoria' and the man Alfred."

During the period in the history of cholera now under review, we have an illustration of the difficulty that often surrounds the subject, in consequence of the inaccurate statements which men holding very influential positions are apt sometimes to make respecting the circumstances of this disease. For instance, Dr. G. Rolleston, of Oxford, writing to the *Lancet* in September 1871, remarks—

“Firstly, then, if the water theory of infection with cholera poison were exclusively true, persons who drank during an epidemic of cholera nothing but distilled water, or soda-water, or water which had been previously boiled, would therefore secure for themselves a perfect immunity from the disease. That this is not the case was shown, if I mistake not, during the Crimean war in the Baltic fleet. At any rate, it has been repeatedly shown since that time. (See *Zeitschrift für Biologie*, 1867, Supplemental Hcft, “Cholera-Conferenz in Weimar,” p. 20.)

“A second answer may be given to any person who may have been carried away by such statements as those I have quoted, in the shape of the following history of an experiment, the truthfulness and accuracy of which is vouched for by no less trustworthy authorities than Sir Patrick Grant, the Governor of Jamaica, and Professor Pettenkofer, who relates it at p. 441 of the volume for 1868 of the periodical I have just quoted. Before railroads had come into use in India, troops in passing from Bangalore to Madras were always obliged to halt for some hours in a certain valley, and always with the consequence of an outbreak of cholera among them. This route was consequently used as little as possible; but Sir Patrick Grant was compelled by circumstances to send some troops by it at the time when Dr. Snow’s theory, and the facts upon which it is based, had exclusive possession of the public mind. Filled with the hope that, by acting upon this view of the genesis of cholera, his troops might be enabled to pass through that valley of the shadow of death unscathed, Sir Patrick issued orders for the prevention of any and all soldiers from entering any of the native houses in the valley, and from drinking any of the water of the district; and, to make the execution of these orders the easier, the troops took with them an abundant supply of water from healthy districts. In spite of all these precautions, the encampment in this valley cost 80, out of the 400 men who entered it, their lives from cholera. This history speaks for itself.

“Similar conclusions to that which this experiment teaches so clearly and terribly can be, though with more trouble, enucleated from some of those singular cases of the ‘capriciousness’ (as we call it) of cholera, and also of typhoid, in clinging to one side of a street or river, and never touching the other. I cannot forbear to add that the mortality which this history records should deter even the most

reckless of the class stigmatized, with not unmerited severity, by Mr. Herbert Spencer, as 'shilling-a-liners writing opinions to order,' from promulgating such dangerous exaggerations as these, I began this communication with quoting, upon matters where the acceptance of their assertions may entail such grave consequences."

With reference to this statement, it is well to remark that Sir Patrick Grant was Commander-in-Chief of the Madras Army. The Governor of Jamaica mentioned by Dr. G. Rolleston was a civilian (Sir John Peter Grant), formerly Lieut.-Governor of Bengal. With regard to the facts of the case, however, we may quote the following passages from a report by Mr. Cornish, Sanitary Commissioner for Madras, on the subject. * He writes—

"There can be little doubt that allusion has been made by Dr. Rolleston to the march of the left wing of the 43rd Light Infantry, from Bangalore to Madras in March 1857, as no other European corps suffered seriously from cholera on that route while Sir Patrick Grant was Commander-in-Chief in Madras. Mr. Cornish, after having perused the medical officer's official report of the occurrences on that march, states that it does not bear out the view either that pure water only was used by the troops, or that the men had been isolated from the cholera-stricken villages on the road. Dr. Madden, now Surgeon-Major, 4th Regiment, was the medical officer who accompanied the wing of the regiment on the march, while Deputy Inspector-General Dr. A. Barclay, the surgeon of the 43rd, remained with the head-quarters and greater part of the regiment at Bangalore. Mr. Cornish continues:—

"The facts recorded show that the 43rd halted for about thirty hours on ground where a cholera-stricken regiment had been but a short time before, and close to a village where there was cholera (but the existence of which disease was denied by native officials); that the medical officer complained of the halting days as giving occasion for the troops to straggle and have access to native bazaars

* The *Lancet*, May 11th, 1872, p. 652.

and native drinks ; that intercourse between some of the men of the regiment and the affected village was certain ; and, in regard to water-supply, it is not very likely that men who could get arrack or toddy from the native villages would refuse to quench their thirst with village water. That the men drank no water but what was carried from above the ghauts is so highly improbable that it is scarcely worth while to discuss the question ; but even admitting that the most scrupulous care had been exercised in carrying water down, it would still require to be shown that the water came from a source where it could not possibly have been contaminated. As cholera was at the time epidemic over a considerable portion of the Mysore table-land as well as in the villages below the ghaut, it would be quite impossible for anyone, without actual examination, to vouch for the purity of a supply obtained from such a tainted country. Professor Rolleston's illustration, therefore, will not, I fear, help us in any way to show that cholera may be propagated in spite of the isolation of travellers, or of their using the purest of water.

"I have shown that there was no isolation from affected places, and I think it may be pretty generally conceded that the evidence does not establish the statement that there was an abundant water-supply taken from healthy districts, or that no other water was used during the march.

"So many wild statements get abroad, doing duty for facts, that I have felt it my duty, bearing in mind the high repute of all concerned in this particular statement, to adduce reasons why no scientific weight can be attached to it."

Dr. Barclay, moreover, fully corroborates the preceding statements in a communication to Dr. Cornish. Dr. Barclay says:—

"No orders were received from Sir Patrick Grant or from any one else as to the carriage of drinking-water from districts known to be healthy for use in others believed to be infected, nor were any means whatever provided for the carriage of water in addition to those sanctioned by regulation.

"On the march of the 43rd cholera was first heard of above the ghaut, and a double march was made to get away from the infected locality. Unfortunately, I think, a halt was made at the foot of the ghaut, and there the disease broke out. The three men first attacked had left camp without leave and gone to a native village in search of drink, which I believed they obtained.

“This outbreak, so far from affording any grounds for disbelieving Snow’s hypothesis, appears to me to tell in an opposite direction. About the same time an officer of the Madras army, Captain S——n, with his family, in all four persons, came up from Madras to Bangalore by transit. The weather was hot, and they suffered much from thirst. Some water was got from the roadside, but so bad was it that the mother-in-law, an old lady, begged of the others not to drink it. Thirst, however, prevailed, and all, except the old lady, drank more or less of it mixed with brandy. On their arrival at Bangalore all except the old lady were attacked by cholera, and all, including Captain S——n, died. He, at all events, had no doubt as to the water having been the cause of this attack, and while suffering from the disease kept constantly calling out what a fool he had been to drink it.”

Mr. Cornish reports, on the authority of Dr. W. Arnold Smith, that the battery of artillery of which the latter officer was in charge was attacked by epidemic cholera on the march between Saugur and Kamptee. The disease made its appearance in camp on the morning of 26th February 1860, at a village named Lodikera, three marches on the Kamptee side of Chindwarra. The company was marching under an escort of a troop of H.M.’s 17th Lancers, *en route* from Saugur to Kamptee. Dr. Smith reports that previous to the above date there had been little or no sickness in the camp. “On the morning of the 24th we marched to Ramakona, descending the Tarra Ghaut, an elevation of about 1,500 feet. A violent storm of thunder and lightning, accompanied by a heavy fall of rain overtook us soon after leaving the camp ground, and many of the men got wet. Near the top of the Tarra Ghaut our detachment came in contact with a large party of native travellers proceeding

southwards from a place called Mahadeo, a village near Chindwarra noted for a celebrated Hindoo temple, and visited by thousands of natives at that period of the year. The multitude had just broken up and were dispersing themselves to their various homes over the whole face of the country, and our line of march was choked by these people and their carts and families. It was not many minutes after coming in contact with these travellers that we noticed that some epidemic was raging amongst them, which proved to be cholera, and as we marched onwards we passed a great many newly made graves, and numbers of these unfortunate beings dying by the road side. It was ascertained that these people had been travelling on our line of route for two or three days (*i.e.*, from the 21st February) from the point at which we met them, and that the disease originated amongst them at Mahadeo.

“Cholera was now in our front and rear, and as it was impossible to prevent our camp followers from mixing with these people as they moved along, a visitation from the disease was almost looked forward to as a certainty in our camp. However, our camp grounds were now chosen with more than ordinary care, as far removed from villages as possible, and at some distance from the road. The greatest care was taken in the selection of water, never allowing these pilgrims to halt near the camp, or even at the stages reached by us. Our camp remained free from disease on that day, but our next march to Lodikera (26th) again brought us in contact with these unfortunate people, who were hurrying forward

at a rapid pace, travelling day and night, and lining the road with their dead. The scenes witnessed by the detachment on this march were disgusting in the extreme. Every bend of the road brought us to a corpse either lying where it had fallen or half concealed beneath a heap of stones. Others were half eaten by wild animals, while the effluvia arising at various points of the road may be better imagined than described. The disease commenced in our detachment while on this march. A man of H.M.'s 17th Lancers, and on arrival in camp one gunner of the company, were attacked, and several native followers were brought into camp who had been attacked on the line of march. Our route lay direct to Nagpore, but finding that the majority of these pilgrims were proceeding in that direction, we struck off on the following day on the road to Kamptee, upon which very few were travelling. The disease continued to increase among the camp followers till our arrival at Kooradee on the 29th, a village four miles to the north of Kamptee. During this time two more deaths had occurred among the Europeans of our escort, and out of 37 admissions amongst the camp followers, 18 deaths had occurred, and a great many natives were missing. For the last three days our line of march had been perfectly free from the pilgrims, and the villages were quite healthy. We halted at Kooradee six days, changing ground every other day, and after the 3rd March no fresh admissions occurred. The remaining portion of the march to Bangalore was accomplished without another case of cholera."

In commenting upon the above facts Dr. Smith says: I think there can be but little doubt that the disease was introduced into our camp by our coming in contact with individuals suffering from cholera, and I am inclined to think, from the previous healthy state of our detachment, and the freedom from all disease of the villages on the line of our march, that we should have escaped the outbreak if we could by any possibility have prevented our detachment from mixing with the above travellers.

Now, with regard to this northern road from Chindwarra to Nagpore, Dr. Cornish remarks it is on record that no cholera existed along it before the pilgrims had passed down it; H.M.'s 17th Lancers went down a few days before Dr. Smith's battery of artillery. The 17th Lancers arrived at Seetabuldee (Nagpore) on the 24th of February, and no cholera had appeared on the road previous to that date; on the 24th, after passing pilgrims dead and dying upon the road, a case occurred, and three days after (27th), while still encamped at Seetabuldee, two other cases. The regiment then moved on *via* Hingolee, south to Secunderabad, and for the first few days the cases were not numerous, but after the sixth day they increased. By the 12th March there had been more than fifty of the Europeans attacked. The regimental apothecary died. The first death in the city of Nagpore was on the 1st March, and in the cantonment of Kamptee some days later. But there is still further evidence that this cholera of 1860 in Nagpore was not an invasion of

the southern provinces from the east. We have seen already that Chanda and Raepore to the east of Napore were not, according to Dr. Bryden's figures, attacked until May and March respectively. But cholera appeared at Hoshungabad 150 miles to the north-west of Nagpore on the Nerbudda river early in February.

Dr. Cornish further observes that the medical officer of the 1st Regiment of Madras Native Infantry, then stationed at Hoshungabad, remarks: Cholera appeared in the station about the beginning of February. There was a large fair at the time in the station; the people forming the fair had come from a place where the cholera was, and there can be little doubt that they brought it with them. It raged violently in the city during the month of February, and notwithstanding every precaution was taken to prevent it, it appeared in the regimental lines in the beginning of March. Up to the present date (31st March) nine cases have been admitted. It is worthy of note that Dr. Bryden's statistics show only two cases of cholera this year, at Hoshungabad in the month of May. The mere fact of cholera being prevalent in a town for three months before the jail population took it, will serve to show how unreliable any conclusion come to on the statistics of the latter must be.

The 50th Regiment Native Infantry left Saugur on the 27th December for Bangalore, *via* Nagpore and Secunderabad. After crossing the Wurdah river on the Hyderabad frontier the corps fell in with cholera in the tract

of country between the Wurdah and Godavery rivers about 100 miles due south of Nagpore. On the 11th February the first case occurred. There were 18 attacks in this regiment. The cholera on the line of route appears to have been an offshoot of the Hyderabad epidemic of 1859, when about 4,000 persons died in the town of Hyderabad, and the disease was very prevalent in the bazaar and a native corps at Secunderabad, up to the end of 1859, or beginning of 1860.

CHAPTER IX.

CHOLERA IN INDIA FROM 1858. PUNJAB EPIDEMIC OF 1861.

OUR information regarding cholera in Bengal in 1857-58 is necessarily defective, on account of the disturbed state of the country; we know, however, that the disease appeared among our troops engaged against the mutinous native army before Delhi, from June to September 1857, and some sixteen cases and eleven deaths took place among the prisoners in the Delhi jail in 1858.* The Lucknow garrison also suffered to a slight extent from cholera in 1857.†

I would only refer however, in detail to the history of one outbreak of the disease which occurred during this year, in connection with its appearance at Kalka.

Kalka is a small village at the foot of the Himalays, on the road leading to the Simla, Subathu, Dugshai, and Kussowli Sanitaria. This village was infected with cholera as our troops marched through it, suffering greatly

* *Punjab Selections*, vol. V, no. 8, p. 39.

† Dr. Greenhow's "Notes during the Siege of Lucknow," *Indian Annals*, vol. X, p. 336.

from thirst induced by the sudden change from the cool climate of the hills to the scorching plains. H.M's. 75th passed through Kalka on the evening of the 12th May, and were attacked with cholera of the most virulent type at Amballa on the 15th May, probably within sixty hours after they had left Kalka. The 1st Bengal Fusiliers passed through Kalka about midnight on the 13th May; two men were attacked with cholera at 10 P.M. of the 14th or 22 hours after leaving Kalka. The 2nd Fusiliers passed through the place on the morning of the 15th May, and suffered greatly from heat and thirst; the soldiers drank copiously of every stagnant pool they passed; on their arrival at Amballa severe cholera broke out. These regiments were perfectly healthy before leaving their stations in the hills.

The water of Kalka is obtained from a spring, which discharges into a square open masonry reservoir. The reservoir is enclosed on three sides by a wall, the fourth side of the enclosure is formed by the hill at the back. At one side of the reservoir and enclosed with the surrounding wall there is a piece of ground about 6 by 5 feet, on which the people stand when drawing water. I found this piece of ground polluted with faecal matter and other impurities, which were being slowly washed by the dripping water into the reservoir. The spring itself was situated in a water course below the level of the village, and its produce was liable to admixture with the drainage and sewage of the village. This is the only spring in the neighbourhood, and people come to it to draw water from a distance of a mile or

more. The circumstances stated show that every facility existed for the infection of the troops through the drinking water.*

During the year 1859 cholera was widely disseminated throughout Bengal and to the north-west as far as Cawnpore, but it did not extend farther in this direction, although it spread directly west and south, attacking the whole peninsula, as Mr. Cornish remarks, from Kurrachee to Cape Comorin; it was very severe in Bombay during the month of May, at the same time its progress through the Deccan was as steady as in 1818-19 and also along the eastern and western ghauts, but it covered this vast space of territory in a very much shorter time than it had done thirty years previously.†

Throughout the year 1860 cholera prevailed in Bengal proper, and in fact from Assam to Oude, and from the sea-shore of the Bay of Bengal away into Central India and Bombay, as well as over a very large portion of Madras; it also spread far up the Himalaya to Darjeeling. The number of deaths from cholera among the prisoners confined in the jails eastward of Cawnpore was nearly four times as numerous as in 1859. Among the small European force at Morar there were 89 deaths from cholera; at Jhansi 13; at Saugur 4; Nagode 15; and Jubbelpore 5. The prisoners in those stations, together with the civil population, suffered in an equal degree. So that we have evidence of cholera of a virulent type, and extensive power of diffusion, having

* *Dr. De Renzy's Report for 1869*, p. 23.

† Mr. Cornish *On Cholera in Southern India*, p. 16. *Madras*, 1871.

been generated over the enormous tract of country above indicated, during the early part of the year 1860. And, as we might have expected, it spread at the same time to Agra.

Dr. Walker informs us that cholera appeared in the city in July, and extended slowly among the natives : "Rain had fallen sufficient to soak the ground, and even to be lying in pools in many places.* On the 10th of August cholera broke out among the prisoners at Agra, at the same time there were 24 casualties from this disease among the European troops at Muttra.

Dr. Walker was of opinion that "the epidemic influence appeared to have been on this occasion more widely spread, and more generally fatal than in former years," a statement which is borne out by his figures, and from the history of the disease in 1859, together with its terrible virulence over the whole of Bengal Proper, the Central Provinces, and as far to the north-west as Muttra, we should naturally have expected to have heard of its immediate dissemination throughout the North-western Provinces and the Punjab, with the setting in of the rains of 1860.

I would call the reader's attention, however, to the exceptional state of these provinces. Throughout this year they were subjected to unprecedented drought, which converted an enormous tract of otherwise fertile country into a desert ; this arid waste was bounded to the east by the Agra district, to the west by Sirhind,

* *Prison Returns for the North-western Provinces for 1860*, pp. 123, 124.

to the north by Deyrah, and to the south by Goorgaon ; and although cholera spread from Bengal and central India up to the very borders of these districts, it extended in no single instance that we know of into this barren area, which constituted what Colonel Baird Smith describes as the famine tract of 1860-61, and which is very clearly defined in chart No. II of his report on the subject ; section 28 refers to the mortality attributable to the famine ; but among the diseases which affected the starving people, he makes no allusion to cholera. 'Throughout the whole of the jails in the famine districts, not one instance of cholera occurred ; and there were only one or two cases among the troops, and some of these are described as "cholera biliosa." Dr. B. Smith, who at this time was in medical charge of the civil station of Delhi, and therefore in the midst of all the suffering, expressly states that the first instance of cholera he heard of among the famine-stricken people was in May 1861. Small-pox and fever raged among the starving people ; but in all the reports and returns I have read on the subject, the existence of cholera is never once alluded to during the year 1860 in the famine-stricken districts.

I am justified, therefore, in asserting, that in 1859 a very considerable portion of the peninsula of India was under the influence of epidemic cholera ; throughout the following year it was reproduced over the whole of this area, with the exception of that part of the country which had been affected by a grievous drought, and thereby converted into a sandy desert.

It is almost impossible for those who have not experienced the influence of the annual rains in the north-west of India, to realize the condition of the country after such a year as 1860. Colonel Baird Smith says: "It would be difficult to exaggerate its forlorn dreariness: it seemed denuded of its inhabitants; that monotonous brown tint of the untilled soil suppressed everything else. It was only by some inquiry it could be learnt, that even in this great waste there was cultivation in plots round the villages, and round the wells remote from villages." This is truly a faithful picture of a desert; and in this country cholera never gained a footing during the continuance of the drought, although the disease raged around it.

It is not my province now to discuss the bearing of this fact on the etiology of cholera; but when taken in conjunction with the circumstances I have related, as occurring in the north-west in 1831, it is very significant, and well worthy of our serious consideration.

This remark is strengthened by what follows, for no sooner had the rains of 1861 set in over the famine-stricken districts than cholera burst out among its inhabitants with terrible virulence. I shall now proceed to demonstrate this fact from documentary evidence bearing on the subject.

In 1861 cholera was reproduced over the whole of Bengal proper; out of 52 jails in this province only 11 escaped the disease. In May the convicts and European troops at Cawnpore and Allahabad were attacked with cholera, and in July those at Gwalior and Jubbelpore

suffered very severely. It is evident, therefore, that cholera was reproduced over the area in which it was principally generated during the previous years; and this remark is applicable to the circumstances of the inhabitants of the Agra and Muttra districts, where, as I previously stated, cholera had been very severe in 1860.

Dr. Smith informs us that "the first heavy fall of rain at Delhi in 1861 occurred on the 31st of May," at which time cholera appeared among the inhabitants of the southern portion of the Goorgaon district, extending from the direction of the Bhurtpore territories. The disease rapidly spread among the famine-stricken people of the district and reached Delhi on the 11th of June. * "It is important to note, that at this time there was not a single case of diarrhœa in the jail, and the amount of sickness in the station generally seemed to be below the usual average; it is well-known that many cholera epidemics are preceded, introduced as it were, by the occurrence of a great amount of generally prevailing diarrhœa; it was not so in this instance as regards the city of Delhi."

It appears that among the prisoners one patient only sank from the effects of the disease within four hours of the time he was attacked by it; of the others, none died under an illness of less than nine hours.

In H.M.'s 82nd Regiment, 80 men were seized with cholera, and 57 of these were in a state of collapse on admission into hospital. "One man had no vomiting or

* *Punjab Selections*, vol. V, no. 8, p. 44, "Cholera in the Delhi Division."

purging throughout ; but after death the intestines were found filled with rice-water fluid."

The men of H.M.'s 107th Regiment, and the prisoners, were attacked by cholera on the same day at Agra (7th July) ; the disease spread with alarming rapidity both among the Europeans and natives ; indeed it had existed among the latter from the middle of June. * Dr. Banister writes from Muttra, that the disease appeared among the Europeans on the 14th July : "The weather being very close, the rain was unusually heavy, the wind continuing to blow from the east."

On the 26th of July the station of Meerut was visited by a heavy fall of rain, which flooded part of the prison enclosure. On the 27th the first case of cholera occurred among the prisoners, and the malady did not cease until the 24th of August ; during this time there had been 664 admissions and 344 deaths from the disease. Cholera had, however, appeared among the Europeans in this station since the 30th of June.

The disease broke out at Umballa about the 17th of July, and continued to extend steadily to the north-west, reaching Meean Meer on the 31st of the month. In this part of the country the rains, though plentiful, hardly exceeded the average of former years.

Cholera (A.) spread to Lahore in August 1861, but did not extend further to the north-west in our territories ; it was very virulent, however, in Cabul during the month of October ; this is accounted for by the

* Dr. J. Murray's *Report on the Epidemic Cholera at Agra, 1861*, p. 3.

fact of its having existed in Western India, especially in Scind, from April to August, and it was probably from this direction, *via* the Goleri pass, and not through Peshawur, that the disease reached Afghanistan in 1861.

On the 6th of August and five following days, fifteen cases of cholera, all of which were fatal, occurred among the European troops at Meean Meer; by the 14th of the month all the regiments in cantonments were more or less affected; and Dr. W. A. Green (Inspector-General of Indian Medical Service) strenuously urged their removal into camp. Unfortunately, it was found impracticable to march the whole of the troops out of cantonments at once—the country for miles round being under water; besides, the commissariat was unprovided with carriage and other appurtenances for a camp of the kind at a moment's call. The military authorities, however, did all in their power to forward Dr. Green's views, and on the 15th of August three companies of her Majesty's 51st Regiment left the station; at the same time the Artillery marched to Shahdera, on the banks of the Ravee, ten miles to the north of Meean Meer. Subsequently, one single case of cholera occurred among the men of this party; but among the troops who remained in the station there were no less than 457 cases and 261 deaths from the disease within the following ten days. In fact, after the 15th of August, cholera increased with such fearful rapidity, that the soldiers in a few days were panic-stricken and hopeless.

In one regiment, out of a total strength of 1,002 men, 863 were employed as hospital orderlies, and of these no

less than 428 were seized with cholera. In the other European regiment at Meean Meer, of 203 cases of cholera, 137 occurred among hospital orderlies. It was not found possible, however, to determine if these hospital orderlies were more liable to be attacked than men who had not been exposed to cholera in the hospital, because all the men in the station had been on duty of this kind at one time or another. On the other hand, we cannot overlook the fact, that the medical officers and the whole of the medical establishment, together with the native servants, almost entirely escaped the influence of the disease, although prostrated by the fearfully harrassing nature of their duties. And what is more remarkable when it was discovered that the European orderlies were unable to work any longer, some thirty Sikhs of the 31st Regiment were daily sent to take their place in the European hospitals, but not a single instance of cholera occurred among these natives.

The Government of India subsequently appointed a commission, presided over by Sir J. Strachey, to report on the circumstances of this outbreak of cholera in the Punjab; and this action on the part of the Indian Government in 1861 was the first effort made since 1817 to gain any real information on the subject of cholera among the troops serving in India. There was no want of material at their command; the record of the Medical Board are full of reports and valuable matter bearing on the subject, an epitome of which had been sent up to the Government every year by the Board. But it was not until the influence of England had begun to tell on India,

and after the country had passed under the direct rule of her Majesty, that it was found necessary to yield in some measure to prejudices (which most Indian officers probably consider the cry on the part of Englishmen) for an inquiry into the circumstances of cholera (A.) in India. Hence the appointment of the commission on the epidemic of 1861. The first section of the report published by these commissioners had subsequently to be withdrawn and re-written, because it contained statements of a personal nature reflecting on the character of individual officers, and to the revised report, published under the authority of Government, the two most influential of the four commissioners refused to append their names, the dissenting officers being Dr. Linton, the head of the British Medical Service in India, and Colonel Gawler, of the Royal Engineers.* This fact prevents my referring in detail to the ideas contained in the report on the Punjab epidemic of 1861. Besides, I am credibly informed by officers who were at Meean Meer, and who visited the cholera patients, that the account of the hospitals given by the Rev. Mr. Sloggett during the epidemic, is, to say the least of it, not strictly according to facts ; and yet this account is the one published by Sir J. Strachey as authoritative, and upon which hangs much of his theory, as to the hospitals having been the most direct cause of the dissemination of the disease.

Had Dr. Green's advice of the 15th of August been practicable, and the whole of the men removed from

* This was the commencement of the Sanitary Commissioners' Office in Bengal.

the station on the outbreak of the epidemic, it might possibly have saved much of the misery that subsequently occurred at Meean Meer; but when once the disease had taken hold of the troops, to have thrust them into tents in the pouring rain would probably have been followed by even worse consequences than befel them, and have been made the subject of just criticism, if not of severe censure.

It is a matter for regret, that the members of the sanitary commission appointed by Government to report on the circumstances of the outbreak of cholera in the North-West and Punjab in 1861, should have entered upon their work with the conviction, "that the mere contamination of the drinking water may cause disease, but it will not cause cholera." It is quite certain however that the water drawn from the well in the Hospital Compound at Mean Meer, and other parts of the station, contained an alkaline fluid impregnated with organic matter.*

In connection with this subject I may mention the circumstances of a case which occurred in another part of the country at this time, under my own observation, and in which the most positive evidence exists as to the fact of fresh cholera dejecta having been mixed with some drinking water, which mixture was exposed to the heat of the sun during the day. Early the following morning a small quantity of this water was swallowed by nineteen persons (when partaken of, the liquid attracted no attention, either by its appearance, taste, or smell).

* *Report on the Cholera of 1861, Appendix, p. xvii.*

These individuals all remained perfectly well during the day; they ate, drank, went to bed and slept as usual. One of them, on waking next morning, was seized with cholera; the remainder of the party passed through the second day perfectly well, but two more of these nineteen people were attacked with cholera the next morning; all the others continued in good health till sunrise of the third day, when two more cases of cholera occurred. This was the last of the disease; the other fourteen men who had drunk of the cholera-contaminated water escaped from diarrhœa, cholera, or the slightest malaise.

In this case it is certain that the contaminated water was once, and once only, partaken of. Its effects were, that out of a party of nineteen healthy men who swallowed it, five were attacked with cholera within seventy-two hours; the remaining fourteen individuals were absolutely unaffected by the poison. These details leave us no reason to doubt, that water, mixed with the fresh dejecta of a patient suffering from cholera, may produce the disease in five out of nineteen people who swallowed it; independently of either the season, nature of the soil, or any other appreciable circumstances.*

Surgeon J. Tulloch has reported the history of an outbreak of cholera on board the "Gertrude" which occurred at this time, and is worth recording, as it seems at first

* I hold myself responsible for the truth of every word in the above statement. Further details would not add to the value of the narrative, and those who profess to require additional proof of the facts before assenting to them, would be satisfied with no amount of evidence I might adduce on the subject.

sight to point to a lengthened period of incubation of the disease in the system. I am however indisposed to accept this solution of the problem as to these cases of cholera, and rather expect if this matter had been thoroughly examined into at the time, we should have discovered that the persons attacked by cholera had been exposed in some way or other to contaminated articles of food, or it might have been clothing which had been soiled before leaving Calcutta. Dr. Tulloch writes : "I will now refer briefly to an outbreak of cholera on board ship at sea, twenty-four days after leaving port, which I conceive to be illustrative of the opinion that cholera poison may be conveyed otherwise than by personal communication. On 21st May 1859 I embarked at Calcutta on the ship 'Gertrude,' in medical charge of a party of wounded and other invalid soldiers for England. Cholera was then universally prevalent in Calcutta, and in several troop ships that had sailed earlier in the season, the disease broke out when they were in the river—a circumstance which caused serious apprehension for our safety at this advanced season, and, I may add, led to our using every available sanitary precaution. Having reached the equator without any signs of cholera, we congratulated ourselves on what we believed to be our escape. But it was not so ; for the 15th of June, when in the 4th degree of south latitude, and twenty-four days from all communication with the shore, hundreds of miles from land, the weather hot and steamy, but not unusual for that latitude, a soldier, invalided for ophthalmia (then convalescent from dysentery contracted on board) was

seized in the morning and died next day. On the same morning, the chief officer of the ship, perhaps the strongest and healthiest man on board, was seized and died in $3\frac{1}{2}$ hours. In the afternoon, a soldier's child, a boy six years of age, was attacked and died on the following morning. On the 20th a soldier recovering from dysentery was attacked and died on the 21st; and on the 25th a strong healthy sailor was seized and died next day.

"If we admit that the cholera poison is of a specific nature, we must admit, reasoning from the above instance, that it was brought in the ship from Calcutta. It could neither have been generated in the ship, nor wafted in the air from a mephitic shore. How and why it exerted its influence at this particular time, and not before or after it, it is unnecessary here to inquire." *

During the year 1862 a severe epidemic of cholera appeared at Pekin, but as yet I have been unable to trace the history of this outbreak of the disease; Dr. Dudgeon reports that "cholera visited Pekin during the summer of 1862. It lasted about two months, and is supposed to have carried off about 15,000 persons, or, estimating the population at a million and a half (probably a rather large estimate), about 1 per cent. It was first heard of at Taku, then at Tientsin, where it was very virulent and exceedingly fatal. It followed the course of the river, attacking the various towns on the banks, and lastly reached the capital. The disease broke

* *Dr. Murray's Report on the Treatment of Epidemic Cholera, Calcutta, 1st June 1869, p. 18.*

out first in the southern city, but soon spread to the northern. When it had entirely left the latter city, many fatal cases still occurred in the former, and principally near the gates leading to the Tartar city. At these points there is a dense population, and according to the usual habit of the people all the offal and filth from their houses was thrown into the city moat, In summer the stench at the bridges over the moat is very great." * In the month of May the Tientsin garrison arrived at Shanghai, which was then threatened by the Jaeping rebels; from the above remarks we learn that cholera prevailed at Tientsin, but it is impossible to say if this circumstance has any bearing on the fact that in May and the three following months cases of cholera appeared among our troops at Shanghai.† In the following year the disease again appeared among our soldiers and the native inhabitants of the north of China; but in Canton and in fact the southern portions of the country the disease can scarcely be said to have prevailed as an epidemic.‡ During the year 1864 there was no epidemic cholera among our troops in China, and we hear nothing of it among the natives of the country.

One of the first ideas that strike us in connection with the history of cholera (A.) from the year 1858 to 1861 is the remarkable effect which meteorological influences exercise on the disease. We have already noticed that cholera appears to have been prevented from extending

* Dr. F. Dudgeon's *Report on the Physical Condition of Pekin*.

† *Army Medical Department Sanitary Reports for 1862*, p. 270.

‡ *Idem for 1863*, p. 113.

into the Cawnpore circle during the year 1832, in consequence of a failure in the annual supply of rain in that province (p. 119), and during the year 1860-61 we have a still clearer illustration of the fact that cholera (A.) of a virulent type commencing in Bengal and extending to the north-west, and in fact over the whole peninsula of India, was stopped in its progress over a very large tract of country, which for the time had been converted into a desert, in consequence of the want of rain. The famine-stricken people inhabiting this vast area of country were preserved from cholera, which was committing terrible devastation around them, until the year following the drought, when the usual rains again filled their empty tanks, wells, and streams with water; and man bearing the poison of cholera within him to contaminate these sources of drinking-water being present, the disease spread among the inhabitants of the previously famine-stricken districts.

The part that man takes in the dissemination of cholera (A.) over India is also illustrated in the present chapter in the case of the Madras pilgrims; but the circumstances here related are of almost daily occurrence in some parts of India. By far the best account we have of these pilgrimages is from the very able pen of Dr. W. W. Hunter, in his history of Orissa. In this work his remarks regarding Puri are applicable to the majority of the places of pilgrimage in India even at the present day. Dr. Hunter writes—

“ But had food is only one of many predisposing causes to diseases which the pilgrims have to encounter. The low level of Puri, and the sandy ridges which check its natural drainage towards the sea,

render it a very dirty city. Each house is built on a little mud platform about four feet high. In the centre of the platform is a drain which receives the filth of the household, and discharges it in the form of black stinking ooze on the street outside. The platform itself becomes gradually soaked with the pestiferous slime. In many houses, indeed, a deep open cesspool is sunk in the earthen platform, and the wretched inmates eat and sleep around this perennial fountain of death. Those whose experience of foul smells is confined to cities in the temperate zone can form no idea of the suffocating stench which such cesspools throw off in a tropical temperature between 85° and 105° during seven months of the year. Nor is there any outlet for the deadly gases that bubble up from them day and night. As a rule, the houses consist of two or three cells leading one into the other, without windows or roof ventilation of any sort.*

In these lairs of disease the unhappy pilgrims are massed together in a manner shocking to humanity. The town contains 6,363 houses, with a resident population of about 25,000 souls.† But almost every citizen takes in pilgrims, and there are not less than 5,000 lodging-houses in the city. The scenes of agony and suffocation that take place in these putrid dens baffle description. 'I was shown one apartment,' says Dr. Mouat in the *Report* above cited, 'in the best pilgrim hotel of the place, in which eighty persons were said to have passed the night. It was 13 feet long, 10 feet 5 inches broad, with side walls 6½ feet in height, and a low pent roof over it. It had but one entrance, and no escape for the effete air. It was dark, dirty, and dismal when empty, and must have been a pest-house during the festival. In this house occurred the first case of cholera of the last outbreak. If this be the normal state of the best lodging-house in the broad main street of Purí, it is not difficult to imagine the condition of the worst, in the narrow, confined, undrained back slums of the town.'

" 'I went into a house in the town this afternoon,' says the curt official diary of the police superintendent. 'Above forty-five pilgrims were putting up, men and women. The place had only

* *Report* of Dr. D. B. Smith, Sanitary Commissioner for Bengal, part i, p. 2, 1868.

† *Idem*, p. 5.

two doors, no windows. One of the doors was locked. This place measured 12 by 20 feet. Certainly not more; and in this place no less than forty-five persons were crammed. The stench was overpowering and the heat like an oven. No wonder the people are attacked with cholera.* Elsewhere he reports 'the space allowed per head to be just as much as they can cover by lying down.' But even this is not always given. 'The poorer up-country pilgrims submit to crowded rooms,' writes the magistrate, 'but the Orissa pilgrims crowd into a room till it would be difficult to introduce another person.'

"There can be little doubt that 90,000 people are often packed for weeks together in the 5,000 lodging-houses of Puri. In some of them the overcrowding falls short of suffocation by scarce a hair's breadth. Indeed, the official reports of the sweltering masses crammed within certain measured square feet seemed so horrible and so incredible, that the Inspector-General of Jails instituted an experiment in a prison ward to test the possibility of the statements. Throughout the whole city we find an average of eighteen human beings packed into each house, consisting of two, or at the most three, stifling cells without windows, at a temperature which, for seven months, is often as high as 105° in the shade, and seldom below 90°.

"At certain seasons of the year this misery is mitigated by sleeping out of doors. In the dry weather the streets of Puri look like a great encampment without the tents. The spiritual army slumbers in regiments and battalions. The same cotton garment which they wear during the day, serves to wrap them from head to foot at night. Tiny rush-lights glimmer amid the prostrate groups, but every face is so completely enveloped in the white cloth that a child might seek its parent all night long across the ghastly expanse of mummies. The soaking dews are unwholesome enough, but as long as the people can spend the night outside, some check exists to the over-crowding of pilgrims by rapacious lodging-house keepers. How slight this check practically proves may be judged of from the fact that the official reports before cited are specially selected as referring to the

* Extracted from the *Diary* of the Deputy Inspector-General of Police; first circle, for the week ending 16th November 1867. Quoted from Sanitary Commissioner's *Report*.

season when people can sleep out of doors with impunity. But the Car Festival, the great ceremony of the year, unfortunately falls at the beginning of the rains. The water pours down for hours in almost solid sheets. Every lane and alley becomes a torrent of a stinking canal which holds in suspension the accumulated filth heaps of the hot weather. The wretched pilgrims are now penned into the lodging-house cells without mercy. Cholera invariably breaks out. The living and the dying are huddled together with a leaky roof above, and a very clay floor under foot, the space allotted per head being just as much as they can cover lying down.

“On the return journey home from Jagannáth the misery of the pilgrims reaches its climax. The rapacity of the Purí priests and lodging-house keepers has passed into a proverb. A week or ten days finishes the process of plundering, and the striped and half-starved pilgrims crawl out of the city with their faces towards home. They stagger along under their burdens of holy food, wrapped up in dirty cloth, or packed away in heavy baskets and red earthen pots. The men from the Upper Provinces further encumber themselves with a palm-leaf umbrella, and a bundle of canes dyed red, beneath whose strokes they did penance at the Lion Gate. As the Car Festival which attracts the great mass of devotees falls at the commencement of the rains, they find every stream flooded. Hundreds of them have not money enough left to pay for being ferried over the network of rivers in the delta. Even those who can pay have often to sit for days in the rain on the bank before a boat will venture to launch on the ungovernable torrent. At a single river an English traveller counted as many as forty festering corpses, over which the kites were battling with blood-stained beaks, and the dogs with dripping fangs.

“The famished, drenched throng toils painfully backward, urged by the knowledge that their slender stock of money will only last a very few weeks, and that after it is done, nothing remains but to die. The missionaries along the line of march have ascertained that sometimes they travel forty miles a day, dragging their weary limbs along ‘till they drop from sheer fatigue.’ Hundreds die upon the roadside. Those are most happy whom insensibility overtakes in some English station. The servants of the municipalities pick them up and carry them to the hospitals. Horrible stories are told

of the fate of wretched women who fall behind or get separated from the company. Even those that reach home contract disease from exposure by the way that cripple them for the rest of their lives. They crowd into the villages and halting-places along the road, blocking up the streets, and creating an artificial famine. The available sleeping-places are soon crammed to overflowing, and every night thousands have no shelter from the pouring rain. Miserable groups huddle under trees. Long lines, with their heads on their bundles, lie among the carts and bullocks on the side of the road. The bridges are paved with their sodden bodies. It is only the fortunate first comers, however, who get so dry a bed. The steep slopes of the road embankments are next taken up. But hundreds have to sit upon the wet grass, not daring to lie down, rocking themselves to a monotonous chant, something between a whimper and a moan, through the long dismal night. 'It is useless to rise and go away,' writes an eye-witness. 'Where can they go? Every house is full. They are soaked to the skin in a few minutes. Their hair mixes with the mud in which they lie, and they await the morning to continue their dismal journey. But many of them rise no more. These are then left to die, forsaken and alone, by the roadside.

"It is impossible I think to reckon the total number of the poorer sort who travel on foot at less than 84,000. It is equally impossible to reckon their deaths in Puri and on the road at less than one-seventh, or 12,000 a year. Deducting 2,000 from these for the ordinary death-rate, we have a net slaughter of 10,000 per annum. Every year, therefore, this homicidal enterprisc massacres six times more men than Plassey, which won for us India, and Waterloo, which redeemed for us Europe, put together cost the British troops, in missing and slain." *

Dr. W. W. Hunter further remarks that, with reference to India, no country in the world more urgently demands the aid of sanitary science; and I would add, where so much has been written upon sanitary improvements and so little done.

* *Treatise on Ambulances*, by Deputy Inspector-General Longmore. By Authority. P. 495, &c.

But he continues—"Year after year cholera (A.) breaks forth from Purí city, and is carried by a continuous chain of human beings into the adjoining provinces. Sometimes it slays its legions, as in the famine year, when it cut off thirteen per cent in the Cattack Jail, in spite of medical treatment, and at least twice or thrice that rate among the neglected outside population. Sometimes it does but little harm ; but it never wholly ceases. ' America, Europe, and the greater part of Asia, may justly blame India for all they have suffered from cholera,' and India can blame Purí for annually subjecting whole provinces to the chance of the epidemic. These overcrowded pest-haunted dens around Jagannáth may become at any moment the centre from which the disease radiates to the great manufacturing towns of France and England. The devotees care little for life or death, nor is it possible to protect men against themselves. But such carelessness imperils lives far more valuable than their own ; and the authority I have already cited declares that ' Europe has a right to demand the necessary preventive measures at the hands of the Government of India.' "

This remark was published some seven years ago, but the Indian Government are probably less disposed now than formerly to come to a conclusion as to the possibility of doing anything to prevent cholera from spreading throughout the length and breadth of the land ; and far less therefore do they interest themselves as to curtailing the passage of the disease from India over other countries. It remains, in fact, for the various governments of Europe and America to trust entirely to their own exertions to protect the inhabitants of the nations committed to their care from invasions of cholera.

The truth of this idea is verified by the history of the Indian Sanitary Commission, established, as recorded in the present chapter, during the year 1861 by Sir J. Strachey. This Board of Health for India, as it has been called, has

now been publishing reports for fourteen years ; and the following remarks, which I have taken from a leading article of *The Times*, dated 18th November 1875, seems to describe the kind of work achieved by the Bengal Commissioners—negative this doubtless is—but a positive evil has been, and is being inflicted on humanity from the want of intelligent action on the part of our Indian authorities with reference to the prevention of cholera among the inhabitants of Hindostan, and its extension from that country over the world. *The Times* observes—

“The moral of all this, it need hardly be said, is that investigations into the causes of disease can only be successfully undertaken by inquirers of special knowledge and special fitness, and that when they are attempted by any who do not possess these qualifications they may easily give rise to the dissemination of dangerous error. Governments and politicians often complain of the perplexity which comes to them by reason of diverse counsels in sanitary affairs, but which only come, as a general rule, because they do not take pains to discriminate between the counsellors whose opinions are valuable and those whose opinions are worthless, or because they are induced, by considerations of party, of seniority, or of finance, to commit important duties to those who are unqualified to discharge them—frequently so unqualified as to be ignorant even of their own unfitness, or of the very existence of knowledge which they do not themselves possess. The most conspicuous recent example of these errors is afforded by the present position of questions of Public Health in India, where they are even more

weighty than in this country, and whence we receive elaborate reports in which that distinction and discrimination of disease on which Mr. Radcliffe so justly lays stress, is almost or altogether disregarded, and in which conclusions not only of the gravest importance, but also in direct contravention of the results of rigid scientific work at home, are formulated upon *data* which are little better than gossiping generalities. A man may be an able surgeon or a skilful bedside physician who yet has never acquired the profoundly difficult art of precise sanitary investigation ; and it is plainly manifest that many of the Indian officers are only just beginning to distinguish between the chief forms of fever, and that some not only confound them together, but also confound them with the still more different fevers which are of malarious origin. It has been fully established in England, and in Europe generally, continental inquiries having followed the lead of Englishmen in this respect, that the most important source of the localized prevalence of typhoid, as well as of cholera, is to be found in poisoned water, on account of the obvious facilities thus afforded for dissemination ; but in some parts of India the simple generalization thus expressed has been distorted from what it is—a mere record of the results of careful observation—into a ‘theory of causation,’ against which a variety of somewhat hazy arguments have been directed. It has been the custom of the India Office, not possessing in England any skilled sanitary adviser, to refer the reports of its officers, as if for a final and authoritative judgment upon their merits, to the Army Sanitary Commission—a body

in which the special knowledge required for dealing with the medical aspects of the matters submitted to them is only inadequately represented. This Commission has lately been called upon to give its verdict on an Indian Report upon a great cholera epidemic, and, while admitting that the details furnished are insufficient even to guide the Commissioners in advising about the removal of common local conditions of filth, has still assumed them to be sufficient to afford a basis for opinions upon the most complicated conditions of causation. The Army Commissioners say of the Indian Report that in most cases the information given concerning local outbreaks is limited to some 'casual remarks' about the drainage or about the wells, and is of little value; but they nevertheless intimate that 'there is no evidence to sustain a current theory that cholera poison conveyed in water is the cause of cholera,' and they thus directly discourage the adoption of stringent precautions to prevent this particular form of pollution. To any one who is familiar with such inquiries, it is manifest that there is no evidence either one way or the other; for that there has been no local investigation of sufficient method or strictness to be of the smallest value. It is equally manifest that what has been proved to be true in England must be true also in India, although there its truth may be obscured by the greater complexity of the conditions; and hence that the first duty of the Indian Government should be to simplify matters in India by acting upon what has been certainly ascertained elsewhere. Professor Tyndall has lately, with much felicity, applied Webster's definition of a squatter,

'one who settles on new land without a title,' to certain unauthorized intruders upon the domain of physical science. It is becoming time that similar squatters should be removed from the domain of sanitary inquiry, and that the public should be spared the expense of printing and disseminating 'casual remarks' or voluminous reports which are officially shown to be of 'little value.' The proper course would be to obtain reports from men whose attainments with reference to the subject matter in hand are such as to entitle them to a respectful hearing."

The medical press at the same time took up this question, and leading articles appeared in the *Lancet*, the *Practitioner*, and other scientific journals, which were even more severe than *The Times* in their strictures as to the conduct of our sanitary authorities in Bengal.

CHAPTER X.

ASIATIC CHOLERA IN BENGAL DURING 1863-64 AND ITS PASSAGE THROUGH BOMBAY TO AFRICA, ARABIA, AND OVER EUROPE TO AMERICA.

THE reports of the various jails throughout the whole of lower Bengal for the year 1863 demonstrate, the fact that this province was subjected to a most severe visitation of epidemic cholera during the early months of the year ; or, as it has been remarked, these tables “show cholera swarming up the Ganges valley in the east, and covering the Behar provinces,” in which we are told not a village of any note escaped. In July 1863 the disease was almost universal from Agra to Hazarabagh, “not sparing one station” in this vast extent of country. At the same time Dr. Cannon, writing from Oude, remarks that in the early part of the year 1863 cholera made its appearance amongst a large body of pilgrims on their way to Ujood-hai, while on the high road between Allahabad and Fyzabad, numbers of whom died, leaving their sick and dying at Pertabgurh, Sultanpore, and Fyzabad, *en route*, which places for some time afterwards became respectively the nucleus of the disease. At Pertabgurh, as many as

300 pilgrims' corpses were found in one day on the banks of the Saie River, and the police had to be sent out to bury them. It appeared in the city and hovered about the cantonment of Fyzabad for several months, and numerous fatal cases occurred amongst the opium Assamees and prisoners in the jail, but, as far as I am informed, there was not a single case amongst the troops in cantonments.

It reached the station of Gondah, and in the early part of June gradually made its way along the new Imperial Road between Fyzabad and Lucknow. On the 19th June it made its appearance in the Dilkoosha cantonments with little or no warning, and selected three officers and a Madras servant as its victims; two officers and the servant died. Not a single case occurred again amongst the troops or in the civil lines, until it made its appearance in the city on the 2nd July in a decidedly epidemic form, and from thence it became general, spreading to the fort and civil lines, but, strange to say, it did not reach the Central Jail until the 15th July.

On the 26th August 1863 the epidemic may be said to have disappeared. It is remarkable that in the civil lines there had not been a single fatal case amongst the European inhabitants; of the five cases that occurred each yielded to timely and energetic treatment, and up to that date there had been only nineteen deaths amongst the European troops of all branches. At the Central Jail, containing a daily average of 2,163 prisoners, there were 100 fatal cases out of 257 treated. The Lunatic Asylum has lost 5 cases out of 100 in-

mates. In the several mohullahs of the city the deaths amounted to 1,874, making a grand total of deaths in Central Jail, civil and military lines, including the native city, of 2,015 persons.

Dr. Cannon writes: "In concluding these remarks, I beg to bring prominently to the notice of Government, that the introduction of cholera into this province appears to me to be of annual occurrence, and from precisely the same cause—viz., the pilgrims' progress from Allahabad to Ujoodhai, which has again carried it into the districts of Pertabgurh, Sultanpore, and Fyzabad."

The disease broke out in an epidemic form among the pilgrims assembled at Punderpore in November 1863, and by these was communicated to the natives of Poona, carrying off scores daily. It destroyed 3,000 persons in the city of Bombay between December 1863 and May 1864.

During the year 1864 cholera was reproduced over Bengal, extending into "the provinces of Central and Western India, which were suffering during the month of March from the effects of an outbreak of cholera almost as deadly and wide-spread as that which three years ago ravaged Hindostan. Letters from most parts of the Bombay Presidency and adjacent territories give sickening accounts of the desolation which this fearful pestilence has made in the land. In Berar and Khandeish the people are dying by the hundred every day. From Surat we hear hardly less a sad tale, and although Bombay itself is still comparatively free of cholera, the

districts of the Southern Concan have been stricken as heavily as Guzerat;” * and later on in the year, in the island of Bombay, the mortality from cholera (A.) had only been once exceeded (namely, in 1850, “the great cholera year”) since registration has been established in the island in 1849. The deaths from the disease in the city of Bombay in 1864 amounted to 4,588, an excess of 2,581 above the average of the preceding ten years.†

Early in the following season the disease spread rapidly along the Malabar coast, when 40,000 of the inhabitants died from cholera.‡ The Mysore and Bellary districts suffered to a fearful extent. We may form some idea of the virulence of the disease in the Bombay presidency during the year 1865, when it is stated that among the civil population upwards of 84,000 deaths were registered from this cause alone,§ and this number probably falls very far short of the actual death rate from this malady.

The epidemic spread northward to Kurrachee and parts of Scinde, and it was said to have extended into southern Persia, along the coast of Nukran, Mogistan, and Laristan, and the north shore of the Persian Gulf as high as

* *Bombay Gazette*, 28th March 1864.

† *Reports of the Medical Officers of the Privy Council and Local Government Board*, new series, no. v. Mr. Netten Radcliffe's *Report on Cholera*, p. 21.

‡ *Cholera in Southern India*, p. 25. By Surgeon W. R. Cornish. Madras, 1871.

§ *Report of Bombay Sanitary Commissioner for 1865*.

Alsaloo, which it reached in September.* The disease also appeared in Hadramaut, Yeman, and among the inhabitants of the Somali country.

The history, therefore, of this epidemic is a repetition of those I have previously given, and, as we might have expected from analogy, we have evidence of the disease immediately extending its influence from Bombay into Yeman.† In May 1865 cholera was raging at Makalla and Mocha,‡ it had spread to Aden where our troops suffered from it precisely as they had done in 1846 and 1858; at the same time Adora and Gondor were affected, the disease extending into Abyssinia.§

Dr. James Christie informs us that Mr. Brener, who was sent in connection with the exploring expedition into Africa, of the late Baron von der Decken, left Zanzibar in May 1865. The party, after visiting several places on the coast, and making short excursions towards the interior, entered the river Jub in June. During the interval they encountered the epidemic, which was raging with great violence on the coast towns. Several of the natives in connection with the expedition died, and the baron himself had a severe attack, but recovered. When the party reached the town of Barderah on the Jub, soon afterwards the scene of the brutal murder of the baron and the medical officer of the expedition, they ascertained that the country in that neighbourhood was at the time

* Netten Radcliffe's *Report on Cholera*, p. 22.

† *Constantinople Cholera Conference*, p. 356.

‡ *Idem*, p. 349.

§ *Idem*, p. 356.

free of cholera, but that the district had been affected. On inquiring concerning its line of progress, Mr. Brenner was informed that it came to Barderah from Gananah, along the trade route, and to Gananah from Berbera, on the Gulf of Aden, along the great caravan route. From Barderah, on the Jub, it passed towards the coast to Brava, and from thence northward to Merka and Mukdesha, and to the south. The epidemic reached the coast in May and continued till August, and spread from the coast towns toward the interior, but not any great distance. At Berbera there is an annual fair held, which lasts from October till April, the place being entirely deserted during the interval. It may be described as the meeting place for the various inland tribes and the traders from the Red Sea, the Persian Gulf, the Gulf of Oman, Aden, and various parts of India. Formerly, as many as 20,000 strangers were usually collected there at one time, and although the fair has decreased much of late years, still there is annually a very large gathering. The inland tribes from the neighbourhood of Gananah would probably leave Berbera in the month of March on their return journey.

It is not certain that cholera actually prevailed as an epidemic during the time of the fair, but there can be no doubt regarding its line of progress, nor regarding its being at about that time in the Red Sea ports.*

My friend, Saeed Bulkht of Syhlet, who was a member of the local council of Mecca in 1865, assures me, that

* *The Lancet*, vol. I, 1872, p. 573.

cholera did not exist in or about the city before the end of March 1865. On the 24th and 25th of that month he states that rain fell over Mecca, and about the same time cholera broke out among the assembled pilgrims. Few men are better acquainted with the phenomena of the disease than Saeed Bulkht; being a native of Lower Bengal, he had seen cases of it, year after year; and he is, moreover, a remarkably shrewd and keen observer. He is well aware of the history of the ships "Persia" and "North Wind," in connection with the outbreak of the disease at Mecca, and his remark on the subject to me was that very likely cholera was introduced by the infected pilgrims arriving in these vessels; "but who can say when there were thousands of men coming and going?" Moreover I have already shown that the disease had spread from Bengal into Central India and Bombay in 1863-64, and had been reproduced over the whole of this territory, with extreme virulence, in 1865; and further, that early in the year it was known to be prevalent along the sea coast of Arabia, and the western shores of the Red Sea, having extended from the various ports in the Bombay Presidency, as it had done on every previous occasion, when it visited Arabia and the shores of the Red Sea, notably as described by Ruttonjee Hormusjee in 1858.

I mention these facts because the majority of the members of the Constantinople Cholera Conference lay great stress upon the disease having been introduced into Mecca by the pilgrims arriving from Singapore in the "Persia" and "North Wind." No doubt cholera

existed at the time in the Indian Archipelago, and that cases occurred on board these vessels after they left Singapore, but not before they had touched at Makalla, to which port cholera had already extended from Bombay. The evidence of the commanders of these vessels on this point is clear enough, for according to the statement of the British Consul at Jeddah, they declared "that the disease by which their ships had been stricken was cholera, which had broken out on board after they had touched at Makalla."*

I am quite prepared, however, to assent to the proposition of the Conference, "that cholera was imported into the Hadjiz by pilgrim ships from India," and it is possible it travelled from Singapore by this means; but to attach undue importance to such incidents to the neglect of those broader features presented by the disease in its course from Bengal into Arabia and the Hadjiz, is to complicate the subject, and tends to withdraw our attention from the major to the minor details in the history of this remarkable epidemic.

Saeed Bulkht confirms the report given by the Commissioners sent from Egypt to examine into the circumstances of the disease at Mecca in 1865; he describes the mortality among the pilgrims in Mecca, Meenha, and Arafat, as having been truly appalling. It is supposed that of ninety thousand people assembled in these places, thirty thousand fell victims to the disease, including those who died from it at Jeddah.

* *Cholera Conference*, p. 529.

At this time there was no epidemic cholera either in Egypt, Europe, or America.

On the 19th of May, the first ship bringing 1,500 pilgrims from Jeddah arrived at Suez. Many of the passengers had died of the disease during the voyage, and the captain and his wife were attacked with cholera on the 21st of May at Suez.*

The pilgrims were at once forwarded from Suez to Alexandria by railway, and on the 22nd of May, the first case of cholera was noticed in a body of these people, on their way to the latter port.

From the 22nd of May to the 1st of June, numerous pilgrims were landed at Suez, and sent by rail to Alexandria, where those who could not be immediately embarked on the vessels provided to carry them to their further destination were encamped outside the city, near the canal of Mohmoudich.

On the 2nd June a case of cholera (the first recognized) occurred among the inhabitants of Alexandria, who were in communication with the pilgrims. On the 5th of June two other cases were reported under the same circumstances. From that date, instances of the disease became more numerous, but until the 12th June they were confined to that portion of the population which was brought into contact with the pilgrims.†

From this time the disease spread over Egypt, de-

* Mr. Netten Radcliffe's "History of the Origin of the Epidemic of 1865," in Mr. Simon's *Report to the Privy Council*, 1865, p. 309.

† *Idem*.

stroying in less than three months sixty thousand of its inhabitants.

The panic excited in the minds of both Egyptians and foreigners in the country was extreme ; from 30,000 to 35,000 rushed away from Alexandria by every conceivable means, throwing themselves suddenly into all the large towns of the Mediterranean to which they could gain access by steamers or sailing vessels.

Mr. Netten Radcliffe observes: On the 28th of June, at a time when neither cholera, nor anything like what are called precursory signs of this disease, existed at Constantinople, an Ottoman frigate arrived in the port, having left Alexandria on the 21st ; she landed twelve men suffering from cholera, and on the 30th ten more ; they were treated in the Imperial Marine Hospital. Within three or four days, some of the workmen engaged on an adjoining building, together with sailors on board a vessel moored alongside the infected frigate, were attacked by cholera, and from this quarter the disease spread over the city and surrounding villages.

In the Dardanelles the first case of cholera occurred in the lazaretto on the 30th of June ; the disease next attacked a soldier on guard at the door of this establishment, and so extended to the inhabitants of the town and neighbourhood. At Enos the first case was reported on the 26th of October in the person of a sailor just arrived from Chio ; the following day his daughter was seized with cholera, and the disease spread to a limited extent in the place.

The introduction of cholera into La Cavalla Salonica

and Volo was most conclusively traced to the arrival of infected persons.*

But the island of Mytelene and the Grecian Archipelago, although subject to frequent invasions of the disease from the landing of infected persons, protected themselves from cholera by means of strict quarantine. This remark is further applicable to the islands of Rhodes and Crete,† and no less so to those of Sicily and Samos. Greece was herself under strict quarantine, and although the disease was brought to her very doors on several occasions she was saved from invasion. The quarantine in Greece lasted as a rule for eleven full days for cholera arrivals, and five days for suspicious arrivals, the time spent on the voyage not being taken into consideration. In Cyprus a lodging-house keeper who had received several persons from quarantine was attacked with cholera on the 7th of July, and the disease then extended through the place.

Cholera spread from Alexandria to Aleppo and Beyruth with the returning pilgrims, a number of cases arriving at the lazaretto in the latter place on and after the 22nd of June. From hence the disease extended all through Syria, visiting Jerusalem about the 21st of September. It is expressly noticed, however, by the sanitary officer at Damascus, that cholera was brought among them by the pilgrims returning *via* Suez and Alexandria, and not by those who arrived by the desert route.

* *Constantinople Cholera Conference*, pp. 537-38.

† *Idem*, p. 539.

We must here retrace our steps a little. It is almost impossible now to ascertain how cholera reached Bassorah, but it is certain that it appeared at Muscat and Bunder Abbas in August, if not earlier in the year ; it may be, as supposed by the Constantinople Conference, extending with the returning pilgrims from Mecca. It is quite certain that the disease spread in this way to Riad, and to villages within 40 miles of Bassorah.* Having reached the head of the Persian Gulf, the disease travelled along its accustomed route up the Euphrates, *via* Imam-Ali, Kerbela, and Hilla. It reached Bagdad on the 17th of September, and Suleimaniah to the north on the 31st October. The disease may have been carried into this town from Aleppo, *via* Kerkouk, a route followed by many pilgrims returning to Suleimaniah. However this may be it appears certain that the north-east of Persia was not invaded by cholera during this year, and this is a noteworthy fact in connection with the disease in India. I have frequently traced the extension of cholera from the Punjab into Cabul, Herat, and Mushed, to Teheran ; but the North-west of India was free from the disease in 1863 and 1864, consequently we have no history of its appearance in the north-east of Persia, although it was extending rapidly from the Persian Gulf, along the banks of the Euphrates, northwards.

We may now follow the course of the epidemic from Con-

* "Sanitary Report on Turkish Arabia," by Mr. Colvill, *Transactions of the Medical and Physical Society of Bombay*, 1-60, 1871.

stantinople along the shores of the Black Sea, and up the river Danube, into the very heart of Europe. The outbreak of cholera at Constantinople occurred towards the end of June, and was followed by a few cases at Samsoun and Trebizond in July and August, these localities being protected as far as possible by quarantine. Sinope, Varna, and Bourgas, appear to have been protected by similar means, the disease hardly extending beyond the lazarettos; but at Erzeroum, the seeds of the disease were sown by a party of labourers arriving from the infected capital; no cholera existed in the place before their arrival, but immediately afterwards it burst out and extended through the town.

Cholera was imported into Novorosusk by sailors from Constantinople on the 18th of August, and from thence extended into the Caucasus; Tiflis in this epidemic being invaded from the west, instead of from Persia as on former occasions. The cholera which prevailed in the Caucasus made itself remarkable by its slow propagation and its feeble development; cramps were rare. The epidemic raged almost exclusively among the indigent classes, and it commenced as a rule with diarrhœa.* The disease was imported into Sulina by sailors affected with it on the 31st of July, and in a population of 3,000 souls, 1,500 of whom had left the town, no less than 300 persons died out of 350 attacked by the disease. At Saint George, a village situated seven hours' march from Sulina, it appeared after the arrival of persons flying from the town; but Lete escaped its influence, the inhabitants

* *Constantinople Cholera Conference.*

of the place refusing to communicate with those coming from the infected locality.*

The disease was evidently imported from Constantinople by sailors arriving with cholera on them at Toultscha on the Danube, about the 15th of August, and it spread into the interior, being reported at several places in Bulgaria and at Salonica.

No cholera existed in Odessa before the middle of July when cases were taken into the lazaretto from vessels arriving from Constantinople. On the 17th of August the disease spread from the lazaretto to the town, and its development was observed with great exactness. On the 17th of August a man named Gouline, a custom-house agent in the service of the lazaretto, fell ill, and was carried in the first instance to his home, and from thence to the town hospital; the next day he expired. His wife, his son, and a servant were also attacked; the latter died. On the 3rd of September a workman named Dorfan in the lazaretto was taken ill; he also was carried to his lodgings in the Jewish quarter. His comrade, who attended upon him, fell ill; likewise the wife of the porter of the neighbouring house; then the husband himself, and then their daughter. Of these Dorfan was the sole survivor. On the 4th of September a workman named Bochinski, whilst going from the lazaretto to his home, was seized with cholera, and succumbed to the disease the next day. His two children were attacked the same day, and two days afterwards his wife.

* *Constantinople Cholera Conference*, p. 548.

There is another case deserving particular attention in connection with the epidemic at Odessa. The wife of a German workman left Odessa on the 16th of August for Altenburg in Saxony, with her child, suffering from diarrhœa. On the 24th, after a journey of nine days, she arrived at her father's house. On the 27th, the child's diarrhœa having become considerably aggravated, the mother called in Dr. Genitz. The mother was in perfect health on that day. At nine o'clock on the evening of that same day she fell ill of cholera, and sank under the attack on the morning of the 29th. At eight o'clock on the evening of the same day her sister-in-law, who lived in the house, was attacked in her turn and died on the 30th. The house in which these two women died became the primary focus of infection, whence the disease spread throughout the town. The family of a workman who had died at Altenberg on the 13th of September imported the disease into Werdau. The dwelling occupied by this family became the starting-point of an epidemic which carried off two per cent of the population of the town. This small epidemic was, according to Dr. Gunther's official report, confined to a space of 38 square miles, in the most densely populated province of Saxony; and with the exception of this epidemic, the whole of North Germany, Hanover, Holland, and Belgium remained free from the disease throughout the year, in fact the north of Europe hardly suffered at all from epidemic cholera during 1865; we may therefore with advantage return to the consideration of the progress of the disease in the countries bordering

on the Mediterranean, and then follow it in its course to England and across the Atlantic.

Italy.—Cholera was imported into Italy by vessels arriving from Alexandria, the first instance occurring at Ancona, on the 7th of July, in the case of a woman who washed the clothes of the sick in the lazaretto. "The epidemic spread in succession throughout the twenty-one communes of the province of Ancona, following in almost every one of them the steps of those who were flying from it." * The members of the Constantinople Cholera Conference assert that the disease did not spread into Upper Italy on account of the measures there taken to stifle the primary germs of the disease. These means being neglected in the southern part of the country, cholera extended rapidly among the people.

France.—Cholera was brought by passengers arriving at Marseilles with the disease upon them, on and after the 11th of June. It soon extended through the town, and from thence to Toulon, Arles, and Aix, where it caused great desolation, and so to Paris.

Spain.—The first case of cholera which occurred in this country, in spite of the strictest quarantine, was in the instance of a Frenchman who arrived at Valencia from Alexandria, *via* Marseilles. The disease spread first to the inmates of the house in which he died, and then became epidemic in the place; 11,000 of its inhabitants were attacked, and of these 5,100 died. The disease spread from Valencia to all the surrounding towns. Cholera was imported into Seville by means of

* *Constantinople Cholera Conference Report*, p. 554.

soiled linen; the woman employed to wash these things was first attacked and died the same day. Almost the whole of Spain was ravaged by the epidemic, thirty-one out of forty-nine of its provinces having been more or less under the influence of the disease from July till the close of the year 1865, the mortality towards the end of the epidemic, in several places, having been far greater than at its commencement.

Portugal.—Cholera extended steadily from the East into Portugal, the first case having occurred at Elvas. During the time the disease was epidemic in the town, a woman and a child left the place for Porto, where the disease did not exist; both of them fell ill of cholera and died. A man and two children, living on the lower floor of the same house, were the next victims to the disease. The authorities had these patients carefully isolated, their goods and effects burnt, and so stopped the plague, which did not attack another person in the place.

Malta.—Early in June, fugitive pilgrims from Alexandria had arrived at Malta, in one if not more vessels in which cases of cholera had occurred; it was not till the 14th of the month that quarantine was established.* The lazaretto was the scene of much crowding, discomfort, and wretchedness. The first case of cholera which occurred among the inhabitants of the island was reported on the 20th of June, in the instance of a girl belonging to the Artillery, living 660 feet from the lazaretto; and although no direct communication could

* *Sanitary Reports, Army Medical Department, 1866.*

be traced between the patient and those in the lazaretto, or affected vessels, still it is important to note the proximity of the house in which she lived to the lazaretto. The girl's mother, and several other people in the same building, were those next attacked by cholera in the island.

On the 30th of June, the detachment of Artillery occupying this infected building were marched into another barrack, and almost immediately after arriving there, the disease appeared among the previous occupants of the place, who had been perfectly healthy till the arrival of their cholera-stricken comrades.

The first case, in the civil portion of the population of Valetta, occurred on the 1st of July, in the instance of a man who had been at work in the lazaretto. From this date the disease spread through Malta.*

Gozo.—This little island, situated five leagues from Malta, remained uninfected till the 21st of July, when a man named Michele Cilia arrived there from Malta, and went to lodge with his sisters. Michele was suffering from severe diarrhoea when he reached his home, but recovered. Three days afterwards his two sisters, living in the same house with him, were attacked with cholera, and from that time a number of their relations and neighbours fell victims to the disease.

In the Mediterranean fleet, consisting of twenty-three vessels, there were only seven cases of cholera throughout the year, and of these four occurred at Malta. The

* *Constantinople Cholera Conference Report*, p. 560.

three other cases were reported from among the crews of vessels anchored off the mouth of the Danube.

Gibraltar.—The transport “Orontes” left Malta on the 6th of July, with a detachment of H.M.’s 22nd Regiment, for Gibraltar, on her way to the Mauritius. There had been no cholera among the men of the 22nd Regiment before they embarked, but the disease had been very prevalent close to the point of their embarkation. They arrived at Gibraltar on the 10th without having had any sickness on board, with the exception of a case of diarrhœa. On the 18th, a man of the 22nd was seized with cholera; this was the first case in Gibraltar. The camp was at once broken up, and the men belonging to the right wing of the regiment were put on board the “Star of India,” which, after forty-eight hours, proceeded to sea.

The left wing of the regiment were moved from their former ground to another camp, but on the 31st two more cases of cholera occurred among them. They were then embarked on board the “Devrinport,” and both vessels sailed for the Mauritius, where the regiment landed in perfect health, not a case of cholera having occurred during the voyage.

Three days after the regiment had left Gibraltar, a man and his child, living near the encamping ground first occupied by the 22nd, were seized with cholera and died; other cases followed immediately around this spot, and from thence cholera extended over the town, destroying 580 people before the end of the year. The 9th Regiment, which had formed a part of the

garrison during the early period of the epidemic, but had continued healthy, embarked for the Cape on the 19th of August. The one wing left for its destination in the "Windsor Castle," and no cases occurred on board. But the other wing started ten days later, and the next morning one of the men was seized with cholera. The ship was at once hauled into the stream, but as no other cases occurred during the next thirty six hours, she then put off to sea. On the 29th, two children on board had diarrhœa, but recovered. On the 3rd of September there were two cases of cholera; fifteen men were seized with the disease within the next ten days, but after this no more cases occurred.*

England.—In 1865 epidemic cholera first appeared at Southampton. In former visitations of our island, the earliest cases of the disease had been noticed at Hull, London, and Edinburgh, ports in immediate communication with the infected portions of the North of Europe. But in 1865, as I have already remarked, with the exception of one or two places in Saxony, epidemic cholera was unknown in Germany, or in fact in any of the northern ports of the continent; and consequently the towns on the eastern coast of England receiving vessels from the continent remained free from cholera. It is no less remarkable that the disease appeared on this occasion in the very town of all others holding the most constant and rapid intercourse

* Dr. Gavin Milroy "On Cholera," *Med.-Chir. Review*, 1868, and *Medical Reports of the Army*, 1865.

with Alexandria and other infected places in the Mediterranean.

Professor Parkes, who investigated the circumstances of the outbreak at Southampton, states "that during July, August, and September, there can be little doubt that the Peninsula and Oriental Company's steamers ran into Southampton after having had cases of cholera (on two occasions) and of diarrhœa (on two or three occasions) on board, during the voyage from Alexandria homewards. The crews of these vessels on landing would disperse over Southampton and its neighbourhood."* Of these vessels the "Ellora" arrived at Southampton on the 22nd of July, and the "Nianza" on the 1st of October. In the meantime the "Vectis," although she does not appear to have had cases of cholera on board was in quarantine at Malta and Gibraltar, and on arrival at Southampton on the 21st of September, she steamed up the river and entered the docks without paying any regard to the quarantine regulations of the port, which are invariably observed under similar circumstances. Moreover the "Delta," which reached Southampton on the 11th of September, had cases of diarrhœa on board of a choleraic character, and which Dr. Parkes considers to have been cholericine.†

The first instance of cholera reported among the

* Professor Parkes, M.D., F.R.S., "On the Outbreaks of Cholera in and about Southampton in September and October 1865," Mr. Simson's *Report*, for 1865, p. 413.

† Mr. Simon's *Report*, for 1865, p. 428.

inhabitants of Southampton was in the case of a man of the name of Rose, a labourer on board the mud engine employed off the town quay, and who lived in a small crowded house with no back outlet, and occupied by three sets of lodgers. The privy was common to seamen and the frequenters of the theatre and brothels only a few yards off. This man was seized with diarrhoea on the 17th, and died of cholera on the 24th of September. The next case occurred on the 28th of September, followed by a third instance of the disease on the 30th. Dr. Parkes found it impossible to trace any direct connection between these cases of cholera and persons or things previously contaminated by the disease. "All the attacks occurred in the low part of the town; they were chiefly scattered, and showed no tendency to aggregation, except in the localities in and about the Rookery, and in Millbank Street, Northam, about half a mile away. It is nevertheless to be observed that in several of the earliest cases of cholera recorded at Southampton, the victims had actually been at work in, or were the wives of men employed at the Northam iron ship-building yard, whence the workmen were sent to repair the Peninsula and Oriental Company's boats. Eleven of these vessels had been under the hands of these men from the 11th of July to the 22nd of October, and among them the 'Ellora' and 'Nianza.' It is further remarkable that on the 16th or 17th of September an outbreak of severe diarrhoea occurred among the workmen in the Northam yard, which lasted till the middle of

October. No such severe outbreak had ever before been known during the seventeen years the yard had been open.'"

Cholera was not confined to the town of Southampton; the second case (Rose's being the first) in this locality occurred in the instance of a boy named Hill, living on Weston Common; this happened on the 21st of September. The boy had been employed in driving a coal cart about the country, "and in the smaller cottages the coal-shed is frequently close to the privy. Admit that there was slight cholera really in the cottages of the sailors belonging to the steamers, this boy was likely to have been exposed to the influences of the discharges."* However this may be, as above stated he was seized with diarrhoea on the 21st of September, and the attack passed on into cholera. His mother threw the dejections on the dust heap just outside her cottage door. On the 26th the boy's father and only sister were taken ill with cholera; they both died. On the 2nd October the man living next door to Hill's house was attacked with cholera and died; and on the 6th a woman who had nursed the Hills, and whose house was close to the ash-pit upon which the dejecta had been thrown, was seized with cholera.

It is beyond my province to enter further into the details of these cases; they are minutely described by Dr. Parkes in his admirable report on the subject; and although he finds it impossible in the instance of this boy Hill to discover any direct connection between his

* Mr. Simon's *Report for 1865*, p. 428.

illness and any person or thing previously tainted with cholera, still I would draw the reader's attention to the quotation I have given above from Dr. Parkes' report, in order to show the possibility of the individual having contracted the disease in his rounds with the coal cart, and further would observe, as I have before done, that Southampton was visited on no less than twenty-three occasions by the boats belonging to the Peninsula and Oriental Company between the time of the outbreak of cholera in Alexandria, and the appearance of the disease in Southampton; the time occupied by the journey between one place and the other, including stoppages at Malta and Gibraltar where cholera was prevalent, is about fourteen days.

We have not done with Southampton yet, however, for the only other outbreak of cholera which occurred in England during the year 1865, was connected in a mysterious manner with this town. A farmer and his wife had gone to Weymouth for change of air, he having been suffering from gastric disorder for some time, which his medical attendant considered to be partly due to the impure quality of the water used in the house. On the 23rd he was attacked with diarrhœa, but he and his wife started for their home at Theydon-Bois, Essex, on the 25th of September: on their way they passed through Southampton where cholera had existed for eight days; but did not go beyond the precincts of the railway station. The day after reaching home the wife was seized with cholera; the husband also continued to suffer from more or less looseness of the bowels. "Both used the

same water-closet on the first floor, between the soil-pipe of which and the well supplying the house with drinking water there was a free communication. The water tainted with the diarrhoeal discharges was used by the family, and by a man and boy mentioned, for five full days, during and subsequent to which several members were attacked with malignant cholera. In addition, three cases occurred among individuals who had not consumed any of the water but had been in communication with the sick ; two members of the family and the visitor, although using the water as the rest of the family, escaped with slight gastric disturbance ; and the youngest son twelve years of age did not suffer from any indisposition whatever. Of the twelve cases nine ended fatally.”*

America.—Cholera appeared at one point only in America during the year 1865, and this was at the quarantine station of New York under the following circumstances:—The steamer “Atlantic” sailed from Havre on the 12th of October for New York, which place she reached on the 3rd of November. She carried 540 steerage passengers, all of whom had passed through Paris which was then infected with cholera. The disease was not known to exist at Havre when the “Atlantic” started, but the very day she left the place a child on board died from cholera, and before reaching New York sixty fresh cases and fifteen deaths had occurred among the steerage passengers ; not one of the cabin passengers or crew suffered. The “Atlantic” on arrival near New

* *Report of the Medical Officer of the Privy Council for 1866.* Appendix, “On Cholera,” by Mr. J. N. Radcliffe, p. 304.

York was placed in strict quarantine, and although fresh cases occurred on board, the disease did not extend beyond the infected ship, America remaining free from cholera throughout the year.

West Indies.—Cholera appeared in the island of Guadeloupe, at the sea-port town of Pointe-à-Pitre, on the 22nd of October 1865, and subsequently spread over the island. The adjacent island of Marie-Galante also became infected.

Dr. Pellarin, who witnessed the outbreak, states that the first person attacked with cholera (A.) in Guadeloupe was a negro; it was reported that immediately before his seizure he had twice visited, if not more frequently, the "Sainte Maire," a French vessel which had left Bordeaux about the 14th of September, cholera existing in that port at the time. This ship lost one of her crew at sea on the 9th October from an undefined illness; and the negro above referred to, returning from one of his visits to the "Saint Maire" after her arrival at Pointe-à-Pitre on the 20th of October, carried with him a packet of linen for the purpose of being washed. The woman employed to clean this dirty linen was seized with Asiatic cholera within three days of receiving the clothes from the "Saint Maire," and in the course of four days no less than four other washerwomen who were working with the individual first attacked with the disease, were affected by cholera; they all died. From this time, cases of the disease followed one another in quick succession, first among the relations and friends of the washerwoman above referred to, and subsequently among the inhabi-

tants of Guadeloupe ; during the six months of its prevalence, it caused 11,957 deaths in a population of 149,407 people.*

“Dominica is twenty-two miles from the main island of Guadeloupe, but only fifteen from some of its dependencies, certain small islands called ‘Marie-Galante,’ above mentioned, and ‘les Saintes.’ Up to the beginning of November 1865, the communications between these small islands and the north end of Dominica were constant, almost daily ; the markets of Marie-Galante were supplied with provisions and vegetables from Dominica ; and carpenters, bricklayers, and others living in Dominica went across the narrow channel to work at Marie-Galante, leaving their wives and families at home. It was on the 2nd of November that a rumour reached Dominica that cholera had broken out at Pointe-à-Pitre in Guadeloupe. On the 4th the Lieutenant-Governor of Dominica sent to the Governor of Guadeloupe for information ; and feeling persuaded after the return of the messenger that it really was an outbreak of cholera, he, on the 9th, declared Pointe-à-Pitre in quarantine. Afterwards, when the news arrived that the disease was spreading through Guadeloupe, the island and its dependencies were placed in quarantine. Despite this precaution a boat from Marie-Galante filled with persons, some still healthy and some sick with cholera, succeeded in reaching Dominica. A strict guard was

* *Hygiène des Pays Chauds. Contagion du Choléra démontrée par l'Epidémie de la Guadeloupe.* Par A. Pellarin, Médecin Principal de la Marine en retraite. Paris, 1872.

placed by the Lieutenant-Governor on the village at which these persons had landed, and 'health guards' with loaded muskets were stationed at every place round the island where landing was possible, to prevent persons from Guadeloupe from setting foot on the island. These measures of precaution were entirely successful, and only two persons died of cholera in Dominica ; and these were two boatmen who landed from the boat mentioned above, and died on the beach close to the village which was subsequently isolated."*

With the account of this outbreak of the disease in the West Indies our history of the cholera of 1865 closes, and from all I can learn of it I may safely remark, as Dr. Snow did of a similar epidemic some fifteen years previously, that cholera "travelled along the great tracks of human intercourse, never going faster than man travels, and often more slowly. In extending to a fresh island or continent, it always appeared first at a seaport. It never attacked crews of ships, going from a country free from cholera to one where the disease is prevailing, till they had entered a port or had intercourse with the shore. Its exact progress from town to town could not always be traced ; but it never appeared except when there had been ample opportunity for it to be conveyed by human intercourse."

Early in 1866 cholera was reproduced in almost all the localities it had visited during the previous year, extended northward as far as St. Petersburg, and

* *Report of the Medical Officer of the Privy Council for 1866*, p. 26.

appearing in several localities in Bavaria, Saxony, and parts of Prussia, as well as in Belgium and Holland. The disease still existed in Paris, extending to the north-west of France about Brest and Caen.* In Luxemburg it early began to manifest itself with virulence. In Spain the disease had continued throughout the winter; but as a general rule the sea-board of the Mediterranean escaped the influence of the pestilence in 1866. Nevertheless, we may safely affirm, that cholera spread over by far the greater part of Europe during the year. The movements of large masses of troops by Prussia, Austria, and Italy, contributed to diffuse the disease, which told terribly on these armies during the summer campaign. It is sufficient for our purpose, however, to know that the disease, in 1866, as on former occasions, was extensively diffused over the countries it had invaded in the previous year, and in place of entering upon the more general details of its extension from one locality to another, we may with advantage turn to the study of its advent in England and America, which had hardly been affected by cholera during the previous twelve months.

I may, however, draw the reader's attention to the fact that during the year 1866 cholera again broke out among the pilgrims at Mecca, and prevailed in most of the caravans leaving that city during the early months of the year. It spread into Mesopotamia and along the Euphrates and Tigris to the north. It broke out in Tabriz with great force. The shores of the Caspian

* Dr. Gavin Milroy's *Report, Med.-Chir. Review*, 1868, p. 210.

Sea and the Caucasus suffered during the year ; and it is remarkable that the English consul at Teheran should have informed the Government of India that during the year 1866 cholera (A.) "came through Koordistan to the North of Persia, and raged during the summer months in Dozerbigan Theroa." * The bearing of this telegram will be understood by referring to the fact that at the close of 1866 epidemic cholera prevailed among the inhabitants of the western states of Rajpootana and throughout the whole of the central provinces. Dr. Eddowes reports that the disease broke out at Erinpoorah for the first time since 1836. It appeared in the Hyderabad, Shekadpoor, and Kurrachee districts, and as far to the north-west as Palee and Tonk, where Dr. Lownds met with Asiatic cholera. The disease was evidently therefore epidemic in the west of India, especially in the Jodhpoor district, which state we may describe as placed directly between India and the great southern high road into Afghanistan, the Bolan Pass, so that it is possible that Asiatic cholera may have been carried by merchants from Western India into Koordistan in 1866, and so into the north of Persia ; or we may suppose that as cholera broke out with fearful virulence in May 1867 all over the Punjab, and right away up to Peshawur, and so into Cashmere and Afghanistan early in July, that the cholera referred to by our consul at Teheran may have reached Koordistan directly through Cabul.

* *Cholera at Teheran.* Foreign Dept. Gov. of India, Docket No. 1,221, August 31, 1869.

We must, however, return to the history of the disease in Europe during 1866, and notice one important case reported by Mr. Simon. The details are from a despatch to the Foreign Office from Her Majesty's Minister at Florence, dated October 26th, 1866. He reports: "The outbreak of cholera at Palermo has taken place under circumstances which merit some remark. Last year cholera prevailed at Naples, Malta, Marseilles, and other places where the intercourse with Sicily is most frequent; but a quarantine of the most stringent, not to say exaggerated form, was enforced throughout the island and the disease never appeared there. The same thing occurred again this summer, and notwithstanding the prevalence of cholera at Marseilles, Genoa, and Naples, it did not make its appearance in Sicily, where quarantine was as before rigidly enforced. Then came the disturbance at Palermo, and the necessity of bringing troops at once from Naples, and of landing them without delay. In a few days it began to be whispered that cases of cholera had occurred among them, and shortly afterwards some of the towns-people were attacked, till, by last returns, above one hundred deaths had taken place within the twenty-four hours.*

The first case reported in Great Britain in 1866 occurred at Bristol, in the instance of a sailor from Rotterdam. On the 2nd of May two more deaths were reported from cholera in Liverpool, among persons also

* *Report of the Medical Officer of the Privy Council for 1866*, p. 25.

just arrived from Rotterdam *via* Hull. On the same day the "Helvetia" sailed from the Mersey with 925 steerage passengers, chiefly foreigners; but cholera breaking out among them almost immediately after they had started, the vessel was forced to put back into Liverpool. After having been purified she again put to sea and reached New York in safety. From the date of the "Helvetia's" leaving Dr. French reports that cases of cholera were of constant occurrence in Liverpool, but that they were sporadic, and that it was not until the 22nd of July that the disease broke out in an epidemic form among the inhabitants of the town; it lasted from that time till the end of November, and carried off 1,792 victims. Cholera was confined to the lower orders living in the most filthy part of the city, and in Dr. French's opinion was not due to a polluted water supply.

The reappearance of the disease at Southampton in 1866 has been very ably worked out by Mr. Netten Radcliffe. He remarks that the disease appeared there after the arrival of the "Poonah," one of the Peninsular and Oriental Company's steamers. This vessel sailed from Alexandria on the 28th of May 1866 at a time when it "is highly probable that the disease was present"* in that town; she entered the port of Southampton on the 10th June, a fisherman having died of cholera on board the day previously, several of her crew landed ill and were subsequently found to be suffering from choleraic

* Mr. Netten Radcliffe's *Report on Cholera*, pp. 75 and 95. *Report of the Medical Officers of the Privy Council*, new series, no. v.

diarrhoea ; from that time cholera spread through the town of Southampton.

The earliest undoubted instance of cholera in or about London in 1866 occurred in the case of a man and his wife living at 12 Priory Street, Bromley, on the 26th of June ; but the first outbreak of the epidemic may be dated from the 11th of July, when five deaths from cholera were reported in London. On the 12th and following days, eleven, twenty, and fifteen persons died from this disease in the metropolis. From that time, life was fiercely assailed by cholera in its most virulent form ; the deaths ran up from fourteen on Sunday to one hundred and five in the course of a few days.

The deaths from cholera in London, for the four weeks ending August the 4th were 63, 481, 1,097, 1,178. Dividing London (including West Ham and Stratford) into two portions, one section of which was supplied by seven water companies, and the other by the East London Water Company exclusively, we find that, in the first section, the deaths from cholera for the four weeks above noticed were 26, 61, 142, 196, whereas, in the second or East London Water-works section, the mortality for the same period was 38, 420, 955, 982. In other words throughout those parts of the Metropolis supplied by the seven water companies, the death rate from cholera had in no instance exceeded 8 per 10,000 of the inhabitants, and in several instances the mortality was less than one half that amount ; but among the tenantry of the East London Water-works, the death rate from cholera had run up to no less than 72 per 10,000. "The explosion of

the disease was, in fact, confined to an area supplied with water from one particular company and from one particular source.”*

We must now briefly examine the circumstances of this remarkable outburst of the disease. The case is a very important one, being one of those characteristic circumscribed onslaughts of cholera which form so prominent and peculiar a feature in its history.

It appears that the East London Company draw their supply from the River Lea, the water being passed through filters into reservoirs, from whence it is forwarded to the consumers.

Now it seems that these filters are very apt to get out of working order in the summer months, their action becoming impeded by sand and a confervoid growth which covers their surface. But a fact still more important to notice is, that two of the reservoirs at Old Ford had never been covered over in accordance with the Act of Parliament. These two open reservoirs were “connected with the filtering beds at Lea Bridge by an open and foul conduit; and they sometimes but not often received waste water from them. The impure contents of these reservoirs have been (but it is averred very rarely) used for distribution in the East London Water Company’s district, in the event of the filtered water running short from an extraordinary demand occasioned by a fire, or from an impeded action of the filter beds.” †

* *Report of the Medical Officer of the Privy Council for 1866.*
Appendix, “On Cholera” by Mr. J. N. Radcliffe, p. 300.

† Mr. Radcliffe’s *Report*, p. 297.

We have the evidence of the carpenter in charge of the water-works at Old Ford, that he admitted water from these open reservoirs into the mains on two occasions, in June and early in July 1866, having been ordered by the engineers of the company to open the sluices, because the engine was drawing air. "It was precisely in the region of the Old Ford water field that cholera raged. There, in three months, it killed little less than 4,000 men, women, and children; while in the Lea Bridge field (another portion of the East London Company's works, supplied from newer and covered reservoirs) and in the other waterfields of London, the epidemic was kept within such narrow limits of fatality as could be accounted for by diffusion through sewers, direct contact with cholera matter in various ways, and the slightly contaminated filtered river water of the other companies." *.

I have already observed that the first cases of cholera reported in or about London in 1866 occurred in a family at Bromley on the 26th of June, and Mr. Netten Radcliffe traced the discharges of these patients into the River Lea, some 600 yards below the open reservoirs at Old Ford. He further discovered that on the 12th of June the dejecta of another suspicious case had been poured into the river only 200 yards below the Old Ford reservoirs. †

* Dr. W. F. Farr's *Report on Cholera of 1866*, p. xx.

† *Report of the Medical Officer of the Privy Council for 1866*. Appendix, No. 7, "On Cholera in London," by Mr. J. N. Radcliffe, p. 311.

We have therefore evidence of the *fomes* of cholera patients having entered the Lea on and after the 27th of June. From immediately above their point of entrance, the water from the contaminated river was passed through an imperfect filter into open reservoirs, from whence it was distributed early in July to a certain proportion of the inhabitants of London and its suburbs. Among the consumers of this contaminated water, epidemic cholera broke out on the 11th of July, and carried off no less than 72 in every 10,000 of those who drank it; whereas the consumers of that part of the same company's water which had been more carefully treated, and of the water supplied by other companies to London, only died at the rate of from 3 to 8 in every 10,000. I need scarcely remark, that an incident of this kind could hardly be assigned to any other cause than the impure drinking water. The tenants supplied from the Old Ford reservoirs differed in no respects from their brethren in other parts of the city as regards their occupation or other circumstances, nor did they live in a particularly low locality; in fact it was found in this epidemic, that the greatest mortality occurred at an altitude of from 10 to 20 feet; the next greatest at from 20 to 40 feet. Nevertheless, Dr. Farr's rule with regard to the altitude and rate of mortality was observed to hold in different parts of the affected district, the death-rate "steadily diminishing without interruption from the lowest to the highest altitude, and yielding the series—167 (under three feet elevation above high-water mark), 89, 88, 76, 17, 4 at from 60 to 80 feet elevation.

Another case which occurred about the same time in London, and which caused some discussion, as an instance telling against water being the agent by which cholera is disseminated, may be briefly considered in this place. It occurred in the City of London Union Workhouse. The whole of the inmates of this establishment were supplied by water from an Artesian well 250 feet deep; the population of the workhouse was 617 souls, out of this number there were 42 cases, and 27 deaths from cholera, and the whole of these cases, with one single exception, occurred among the 148 inmates of the infirmary. The infirmary, though faulty in construction, was in admirable order at the time of the outbreak of cholera, and not overcrowded.

The first person attacked was a woman, who had been admitted into the house for diarrhœa, but the looseness of the bowels ceased, and she seemed well, until struck down by cholera on the 24th of July; she was virtually in a state of collapse from the outset of the attack, and died in twelve hours. The next case was that of the stoker of the infirmary, living on the basement floor, and having no communication with the inmates of the building. The third case was that of a man in charge of the gates leading into the infirmary yard. In all there were fifteen cases of cholera among the inmates of the infirmary on the first day of the outbreak, on the following day (the 25th July) nine more persons were struck down by the disease, and during the next ten days eleven other women and five men, making a total of thirty-nine of the sick in the infirmary, together with

two healthy individuals employed upon the infirmary premises. *

Mr. Radcliffe has given us minute details of the circumstances of this outbreak, and endeavoured to discover the source from whence this cholera originated; but he does not mention if the water drawn from the Artesian well was directly conveyed from its source to the patients in the infirmary, or if it was allowed to stand in a cistern or vessels from which the patients drew their supply. If this were the case it seems very possible that the foul effluvia which he describes as having been complained of by the patients in the infirmary, on the evening of the 23rd of July, might have impregnated the water; or rather that the organic matter which affected the olfactory nerves of the patients so sensibly on the evening in question, might also have become absorbed by the drinking water, and have produced the disastrous effects of the few following days. But this is purely a conjecture on my part; of one thing we are certain, which is, that the offensive odour arose from the hospital drains which emptied themselves into the main from Mile End Road, at this time containing choleraic evacuations. The barometer suddenly fell on the 23rd of July, with a low temperature, indicating atmospheric conditions eminently favourable to upward currents from sewers. It is no less remarkable that the patients first seized were those nearest the traps opening into the sewers, and further, that the people occupying the wards through which the prevailing wind

* *Report of the Medical Officer of the Privy Council for 1866.*
Appendix, "On Cholera," by Mr. J. N. Radcliffe, p. 312.

would have directly carried the foul air arising from the traps, were those prominently and chiefly affected on the 24th and 25th of July.

Cholera was more or less diffused over England during the summer of 1866, but it showed here, as in other parts of the world, the most mysterious partiality for some places, leaving others, under apparently similar conditions, absolutely untouched ; for instance, Manchester remained comparatively intact while Liverpool suffered severely. The towns along the eastern coast of England, and in direct communication with infected ports on the continent, were, during this year, hardly affected : in Hull, there were only twelve deaths from cholera, in Newcastle and Gateshead eight, Sunderland twenty-six and so on. Of thirty-three counties in Scotland, fifteen only were affected. In fact, the United Kingdom was, on the whole, but slightly visited by the epidemic of 1866, and the same remark applies to Denmark and Sweden.

Dr. Mapother informs us, that cholera was introduced into Dublin in 1866 as follows :—

At 11 a.m. on the 26th of July, one of the City of Dublin Steam Company's vessels landed from Liverpool, Jane Magee, aged 16. During the voyage she had been severely purged and vomited, which was attributed to sea sickness ; but she recovered so much, that after having rested at the house of her aunt's, 22 City Quay, she spent some hours visiting her friends in that neighbourhood. At about three o'clock, she became very ill, and Dr. Shanahan being summoned, pronounced the case to be one of cholera. She died about 10 that night, and I, having received intimation through the police, examined the body, which presented every feature that cholera leaves behind. I had the windows of the rooms and lobbies opened, and some chloride of lime thrown about the

premises ; but all my efforts to prevent a "wake" were ineffectual, as they would not believe that the girl had died of cholera, and they did not wish to have the funeral until after the arrival of her mother from Liverpool. On the following morning, with the aid of the coroner, interment was insisted on, and directions were given to the family, with the object of preventing the spread of the disease.

Next day I went to Liverpool, for the purpose of ascertaining how she received the contagion, and of observing the type of the epidemic in that city. At 3 Upper Frederick Street, near the river, this girl's mother had kept a lodging house for sailors, chiefly those from Dutch ports. It was denied that any cholera had occurred in the house, but the keeper of a warehouse about eighty yards off, in the same street, had died of that disease three days before Jane Magee left, and it was very rife in the neighbourhood.

At 7 a.m., on the 30th, Mary Meyler, a cousin of the deceased, aged three years, who lived in the same room was attacked ; this was ninety-one hours after Jane Magee's arrival in the house. She died at 9 the same night. The third case was that of the father of this child, Andrew Meyler, aged forty, a sailor of intemperate habits. He came from sea on the night of the 27th to live in the same room. The circumstances of this case were sudden and melancholy in the extreme. While returning home with a coffin for his child (which he had got in Cook Street, where he imported the disease), at 4 o'clock on the morning of the 31st, he was seized with cramps ; and in an hour after, when I saw him, he was in hopeless collapse, dying in thirteen hours from the accession of the first symptom of illness. His wife, the fourth and last victim from the room, was seized at 10 a. m., on the 1st August. She could not be persuaded till the following day to go to the hospital ; she was then admitted into Sir. P. Dun's Hospital, and survived till the 5th. After her removal to the hospital, the house was completely emptied, and all its premises disinfected, and no cases occurred among the inmates, or in the immediate neighbourhood.

Six other cases, distinctly imported from Liverpool, established foci of contagion before the disease could have been said to be epidemic. *

* *Lectures on Public Health*, p. 440. By Dr. Mapother, Dublin, 1867.

Dr. A. M. Ballot of Rotterdam has given us very valuable and interesting information regarding the development and spread of cholera (A.) in Holland, during its various visitations to that country. He writes to the *Medical Times and Gazette*, May 1869:—

“The kingdom of Holland is divided into provinces, some of which are more elevated than the others. The country is intersected by rivers, ditches, and canals. The rivers are partly liable to ebb and flow, according to the direction of the wind; and in so far as they are, all noxious substances susceptible of it have an ample opportunity of sinking, so much the more as between every ebb and flow there is a stagnancy of the current. The canals receive their waters from the rivers or from the polders.* The water in the canals, ditches, and polders is generally at the same level. The water we drink is chiefly drawn from these rivers, ditches, and canals, and also from wells. Rain water is only drunk where nothing else is to be found. It is only the wealthy who first filter their water. As it will appear afterwards, there is a difference in the soil of the different provinces which causes the well water in different places to be of a very different nature. If we consider the putrid matters by which all these waters are corrupted we find them innumerable, so much the more as they are farther distant from the river. These putrid matters are in the first place the human excrements which flow away in rivers or canals, or, being collected in pits built of bricks, sink largely into the ground. The corruption of the water by these substances is but too evident. In Rotterdam, for instance, the openings of the pipes through which the water passes into cisterns, from which it is carried up by pumps into the houses for domestic use, and the sewers of the privies are found in the same quays separated only by a few feet distance. As for the wells, their water rises and ebbs according to that of the neighbouring canals or ditches. In 1832 Professor Mulder proved

* A polder is a low ground or drained lake surrounded by dikes, and kept dry by means of draining mills, which remove the water into a river or a canal.

that in many of our towns, and principally at Rotterdam, our wells contain nothing but soakage water.

Most of the cholera plagues that, since 1832, have prevailed in our country first appeared at Rotterdam, and thence spread over the country along the Meuse and the canals. Besides, the innumerable travellers who from different parts arrive at Rotterdam by railways, steamboats, stage coaches, &c., and after a few days' sojourn return home, were the means of propagating the cholera throughout the country.

I profess that I and many of my countrymen are not able to say in how far Pettenkoffer's theory of the ground water may be applicable to the lower part of our country. We should be glad to hear that learned man's opinion upon this subject after personal inquiry into it on the spot. Everything is artificial in the lower districts of our country, and there the cholera is always the most powerful.

Table I.—Mortality in Twenty-one Chief Towns during Five Cholera Epidemics in the Netherlands.

TOWNS.	1829. Popula- tion.	1832-3. Mor- tality.	1848-9. Mor- tality.	1853-5. Mor- tality.	1859. Mor- tality.	1866. Mor- tality.	1866. Popula- tion.
Amersfoort, . .	11,782	144	118	38	—	186	13,248
Amsterdam, . .	202,364	1,273	2,273	1,921	136	1,101	262,840
Arnhem, . . .	14,507	201	466	61	55	427	29,644
Breda, . . .	13,114	112	—	145	23	128	15,225
Delft, . . .	15,023	173	578	237	118	428	22,032
Dordrecht, . .	19,972	255	560	134	135	398	24,124
Gouda, . . .	12,878	271	373	154	142	154	15,514
Groningen, . .	30,260	471	833	293	27	1,046	37,312
Haarlem, . . .	21,667	102	260	43	—	216	29,589
Hague (The), .	56,105	359	609	173	78	1,016	87,319
Hertogenbosch,	20,489	330	—	—	—	296	24,222
Kampen, . . .	8,882	51	204	140	—	305	15,489
Leeuwarden, .	20,938	113	206	23	—	64	25,059
Leiden, . . .	34,564	594	935	87	327	892	38,492
Maestricht, . .	24,444	—	304	87	1	299	28,719
Meppel, . . .	5,725	25	86	56	—	216	7,573
Nymegen, . . .	17,734	66	7	1	10	68	22,508
Rotterdam, . .	72,294	1,845	2,083	1,541	455	1,211	115,354
Schiedam, . . .	11,588	299	301	229	79	217	16,820
Utrecht, . . .	43,407	502	1,663	487	286	1,619	58,995
Zwolle, . . .	15,640	91	268	67	4	204	20,448

The population of 1829 is the result of the decennial official census taken in that year ; that of 1866 is taken from an official report.

In Table I, I have brought together all the towns where the cholera epidemics that have afflicted our country have prevailed in any sensible degree. This table shows that the different towns have been afflicted in different degrees. Some of them have only been afflicted a few times, others more frequently but not so violently; others, again, a few times but in a high degree; others, at last, at every epidemic and almost always in a high degree. A slight look at this table will show us that the cholera epidemic of 1866 is by no means inferior to its great predecessors in malignity. There was in our country a cholera mortality equal or superior to the greatest mortality in other countries. In 1866 in the whole kingdom 19,691 persons died of cholera, or 55 in 10,000 inhabitants.* In the same year the mortality amounted—

For Zwolle, . . .	to 96 in 10,000 inhabitants.
Rotterdam, . . .	105 „ „
The Hague, . . .	112 „ „
Bois-le-duc, . . .	422 „ „
Schiedam, . . .	129 „ „
Amersfoort, . . .	140 „ „
Arnhem, . . .	144 „ „
Dordrecht, . . .	163 „ „
Delft, . . .	190 „ „
Kampen, . . .	196 „ „
Leiden, . . .	231 „ „
Utrecht, . . .	274 „ „

If we compare with these numbers the mortality in East London—72 in 10,000 inhabitants†—we find a most considerable difference in favour of East London.

* In England and Wales the whole mortality amounted to 14,378 in 21,210,020 inhabitants. (*Report on the Cholera Epidemic of 1866*, Appendix, p. 52.) In the United Kingdom 17,793 in 29,946,058 inhabitants, or 6 in 10,000.

† *Report of the Cholera Epidemic of 1866 in England*, p. 21. The mortality from cholera in London, without East London, was 5 in 10,000. (See p. 17.)

By casting up the cholera deaths in every place in Table I, and comparing them with the population of 1849, occupying a middle place between the first and last epidemical years (1832 and 1866), we shall obtain the following result :—

Table II.

TOWNS.	Population, 1849.	Mortality.	Proportion of Mortality to Population.
Leenwarden, . . .	24,490	406	1 in 60
Haarlem, . . .	25,852	621	1 41
Maestricht, . . .	25,140	691	1 36
Bois-le-duc, . . .	21,873	626	1 34'9
Breda, . . .	14,169	408	1 34'7
Amsterdam, . . .	224,035	6,704	1 33
The Hague, . . .	72,225	2,240	1 32
Zwolle, . . .	18,168	634	1 29
Amersfoort, . . .	12,222	486	1 25
Kampen, . . .	12,185	700	1 17'4
Meppel, . . .	6,639	383	1 17'3
Dordrecht, . . .	20,909	1,286	1 16'1
Arnhem, . . .	19,111	1,210	1 16
Gouda, . . .	13,788	1,040	1 13
Leiden, . . .	24,490	2,835	1 12'66
Rotterdam, . . .	90,073	7,135	1 12'62
Groningen, . . .	33,694	2,704	1 12'45
Delft, . . .	28,449	1,534	1 12
Schiedam, . . .	12,736	1,125	1 11
Utrecht, . . .	47,781	4,557	1 10'5

The death-rate has no absolute value here, it has only a relative one. It shows still more evidently that the different towns have a different predisposition for cholera, offering it more or less facility for its settlement and propagation; for though in a certain place the cholera has been more violent than in others—as, for instance, the Hague showed in 1866 a larger number of cholera deaths per 1,000 than Rotterdam—yet by the absolutely larger number of deaths in Rotterdam it appears that there must be a particular cause why the illness so easily takes root in that town, as also in Leiden, Groningen, Utrecht, and a few other places.

When we consider the seven towns last mentioned in Table II, showing the greatest mortality, and inquire into the points of similarity and difference between them, we shall find that the soil of Leiden, Groningen, Delft, Schiedam, and Utrecht is clay, that of

Gouda fen, and that of Rotterdam clay and fen. In all these towns the inhabitants drink water from a river, ditch, or well. As for sewage, the excrements can, or could formerly, freely soak into the ground, or are or were carried off into ditches and canals.

If we reflect on how porous a bottom, in which already putrid (rotten) organical matters are to be found, all these towns have been built, and when we see how these cities pollute that porous bottom by their excrements, whilst those towns that are situated on rivers or canals have their sewers pouring their contents directly into them, we find in those places one thing common to all—viz., drinking water drawn either from a ground polluted for centuries by human excrements or from rivers, canals, and ditches into which the excrements pass off from the sewers. Even though the wells whose water is drunk may have been wholesome in times past, yet the expression of Mulder is applicable to them, that “at length, in a town where the excremental and other matters are unlimitedly brought into the ground, every well becomes impure.”

I will now relate a few well established facts that happened in our country :—

In 1866 a society for the improvement of public health at Utrecht inquired into the course and cause of the cholera. Dr. Snellen, an excellent observer, noticed that in a block of houses of a certain quarter of the town, inhabited by twenty-four families, thirty-two persons in twenty-one dwellings were seized by cholera—it was 30 per cent of the population—and twenty-three died. In the whole town of Utrecht 4 per cent of the population were seized by the epidemic. Those houses had not been built in a bad manner : on two sides they received light and fresh air. The people that inhabited them did not belong to the class of the poor. At the back of the houses is a common yard ; along the houses is a foot pavement, then a row of Linden trees, and the rest of the yard is used as a bleaching-ground. In this yard there are seven privies in pretty good condition, all running off into a ditch along the wall at the end of the bleaching-ground, and communicating with the canal. Here are found two wells with wooden pumps that supply clear and drinkable water. The foot pavement along the houses was full of holes or unevennesses in which the foul water collected. The effects of the first cholera patient, bed, clothes, ewers, and pots,

were aired and cleaned on this pavement. On inquiry the wooden pumps proved to have become wormeaten at the lower end. On July 4 one of the pumps, and on the 5th a second, were replaced by new ones perfectly impervious. After July 6 not a single person in that quarter had a fit of cholera. All the cases which happened there occurred between June 11 and July 6, whilst cholera continued in Utrecht till the autumn. It is perhaps a mere accident that from the date of July 6 cholera left that quarter, but it is not probable. It is far more likely that infected matters got into the waters of the pumps in the common yard, and so arrived at the stomach, and bowels of the other inhabitants.

Immediately adjoining to the block of houses just mentioned, we find a charity institution called the Stephen's Foundation. This foundation consists of fifty houses or dwellings, inhabited by 260 persons, one of whom only died of cholera, and that one had drunk water from the above mentioned pump.

At Leiden, says Dr. Winkler, they drink well-water, *i.e.*, water of the Rhine that has soaked into the ground. Leiden is a very old city; of course innumerable human bodies lie buried there. How wholesome that well-water of Leiden must be! The privies communicate with the canals by means of sewers, or the excrements are gathered into pits which seldom require to be emptied in the usual manner, the ground being kind enough to imbibe whatever is liquid in them. And there was plenty of cholera at Leiden.

Now, let me enter into more details about Rotterdam, a town that looks so airy and wholesome, and yet has obtained so sad a reputation in all the cholera epidemics, where, besides, the usual average mortality is 34 in 1,000.

Rotterdam consists of three parts. One part (A) forming an irregular triangle, the base of which is situated along the Maese, is intersected by spacious canals, so that the largest ships can get into the inner part of the town. The ground of that part is clay, here and there with fen. The water they drink there is drawn immediately from the river or the canals.

The second part (B) has a lower situation. It is intersected by two small rivers, the Schie and the Rotte, and is surrounded by a canal or ditch (*singel*). The ground consists of clay and fen. In this part they drink well water, very seldom rain water, and also water from the river.

The third part (C), called the *Polderstad* (Poldertown), is still lower. Where it is standing now there were formerly gardens and arable land, intersected by ditches. The ground is fen and morass. In this part they drink nothing but well water.

Part (A) is in direct communication with the river. The water in the canals is liable to cbb and flood.

Part (B) is surrounded by a canal receiving fresh water at its two extremities.

Part (C) is also enclosed by a canal which is properly an open sewer. From the canal of part (B) water is admitted into the numerous small ditches of the Poldertown, which receive all the excrements of the inhabitants of this part. After having passed through all those ditches, the water, converted into sewage water, runs off into the canal that surrounds part (C), and thence is carried off by two steam draining mills, at the west into the Maese, at the east end into one of the canals of part (A).

It may easily be conjectured in what condition the water in the wells of the Poldertown is on learning that these wells are generally of little depth, and are dug in a morass pierced by many thousands of piles on which the houses have been built, whilst the ground is charged with infected water, and, moreover, contains cesspits.

In part (B) the sewage is similar to that in part (C). The excrements are either gathered in pits or run off for the greater part into the Schie or Rotte, so that the well-water is by no means better here. Besides, the Rotte flows along the general burial ground of Rotterdam, and cannot regularly pour its water into the Maese. The Schie runs through several towns, and going along receives all the human and animal excrements. It may be imagined how drinkable the water of the wells will be here. It is often troubled, and has a peculiar smell.

One would be tempted to think that part (A) has excellent water to drink from those wide and deep canals which many of your countrymen have admired when arriving by the London or other packet boats at our beautiful spacious quays lined with trees. But they are mistaken. First, these waters are corrupted by all the sewers discharging into them. Secondly, those canals are covered, as it were, by large and small vessels, the population of which is still more numerous than that of the neighbouring houses, and they

throw all their excrements into the canals. Thirdly, this water is spoiled by that of the Schie and Rotte, the sluices (floodgates) of which are opened when the tide is ebbing to allow their filthy contents to pass off through the canals into the river; this passage soon becomes visible by a black tract in the canals, which afterwards spreads over the whole of them. Finally, as it has been observed already, the water from the sewers of the Poldertown is emitted at the east end of the town into the canals, and passes off through them into the river.

Let us now consider—

1. That at Rotterdam the inhabitants generally drink water thoroughly vitiated by sewage matter.
2. That this town has a porous bottom saturated with organic matters in a state of decomposition.
3. That there is a frequent intercourse of people from all countries.
4. That cholera prevails in Rotterdam as soon as the disease has reached any neighbouring point.

Is it a wonder, then, that we renounce all other hypotheses, and that we attribute the cause of the propagation of cholera to the water, and exclusively to the water we drink?

All our sewers either discharge directly or indirectly into our ports and canals, or their contents have an opportunity to get into the wells. The excrements of all the foreigners are in the same way taken up in the water that is drunk by the whole population. Is there any theory that explains the first appearance of the cholera in a town so evidently as that of the water we drink?

Poverty, want, a dense population, human misery, cannot be denied to be found in this city. But are they comparable to those we meet with in the vast centres of the world? are they comparable to those we see in the poorest quarters of London? Is there not an immense distance from the human misery and depravation in London and Paris to those in Rotterdam? And in your country the cholera disappears, whereas it keeps its force in our country. Much is done here, many hygienic improvements are effected—so many even that some persons, observing the unrelenting rigour of the plague, are heard to say, “Look, now; however you try to banish the cholera it is good for nothing.” But the drinking water has remained as it was. Nay, rather, the increasing population of our town, and the

places situated on the rivers, which emit their waters through our canals into the Maese, render it continually worse.*

If it is necessary for the first propagation of the cholera that cholera excrements get into the water which is drunk, and so pass into the stomachs of other persons, it is also necessary that people have a predisposition to be attacked by it. A want of coincidence between these two conditions may explain how, in a little solitary town, a single case of cholera is imported without being followed by others.

The appearance of cholera in places and persons that have apparently had no connection with choleraic foci, stated in so many reports on cholera epidemics as a proof that these epidemics were self-generated or autochthonic, may be readily explained by the theory of propagation by the agency of water.

In conclusion (1.) our country is highly affected by the cholera at every epidemic, chiefly in those parts where they drink water directly from the rivers and canals, or from the ground saturated with sewerage matter.

(2.) In places where rain-water is generally drunk the disease is by far less violent.

(3.) Places where there is no other drinkable water but rain-water are not effected by the epidemic; the single cases occurring there are imported.

(4.) When places affected by the cholera were supplied with pure water instead of the vitiated water, the disease disappeared.

We must now briefly refer to the circumstances under which the disease appeared in America in 1866. The quarantine station of New York was alone visited by cholera during the year 1865.

The "England" sailed for Halifax from the Mersey on the 28th of March 1866. Cholera broke out among the crew six days after leaving, and before she arrived at Halifax no less than ninety-two souls had perished; the

* When in the past year (1867) our water was chemically and microscopically analyzed, the discoveries of Hallier and others about cholera cryptogamia were still unknown.

thirty-seven saloon passengers, however, entirely escaped the effects of the disease.

The crew of the "England" were landed on an island near Halifax, and the sick sent on board the "Pyramus." Up to this time there had not been a single casualty from cholera among the inhabitants of Halifax. The first persons attacked on shore were the two pilots who brought the "England" into harbour, but without, as they declared, going on board of her; they remained in their boat alongside the vessel till she was moored; one of these men, Terence, was immediately afterwards seized with cholera, from the effects of which he died; and the other pilot, Purcell, recovered, after a very severe attack. Of Terence's family, four children were attacked with the disease, and two of them died. Three of Purcell's children sickened, one severely, the others slightly; they all recovered.

No other cases occurred in or near Halifax except in a family living on the beach. On the 22nd, one of the children was seized with cholera and died; the mother took the disease on the 25th and died also. This circumstance has been accounted for by the fact of a lot of bedding having been thrown overboard from the "England," which had floated ashore near the house inhabited by this family, and the children were known to have handled and played with these contaminated articles.*

In spite of the most strenuous efforts to stop the ingress

* A full account of this case is given by Dr. Barrow in the *Army Medical Reports* for 1866.

of cholera into New York, by means of quarantine laws and regulations, it broke out in that city about the beginning of May, and from thence gradually spread over the country. Its course has been admirably described as it affected the army of the United States in 1866.*

The first case of cholera reported among these men, occurred in the person of a recruit on Governor's Island, New York, on the evening of the 3rd July. Of the previous history of this case nothing is known. "Recruits from Governor's Island carried cholera to Hart's Island, where the first case occurred on the 8th of July. The epidemic becoming severe among the troops at this post, they were moved on the 20th to David's Island, where the disease subsequently prevailed." Cholera was clearly introduced by troops from Hart's Island among the inhabitants of Tybee Island, and to their comrades in New Orleans, and along the stations down the Mississippi. For instance, "the steam ship 'Texas,' with recruits from Hart's Island, left New Orleans on the 19th of July, and arrived at Galveston, Texas, on the 22nd. The day after their arrival one of the recruits was attacked with cholera, and died in thirty-six hours. In the outbreak which followed, forty-four cases and twenty-four deaths are reported among the white troops at Galveston."

I should weary the reader by going further into these details, but would refer him to the very able report on the subject by Dr. J. J. Woodward of the United States

* *Circular No. 5*, War Department, Surgeon-General's Office, Washington, May 4th 1867.

Army. The conclusions, however, at which this officer has arrived, regarding the principal influences at work in the dissemination of cholera, are too important to be passed over in silence, and I may best give them in nearly his own words. Dr. Woodward remarks, that "a thoughtful consideration of the facts embraced in the foregoing brief general statement, and in the appended reports, shows that they possess a two-fold significance : on the one side, in connection with the question of quarantine; on the other, in connection with that of local hygienic and therapeutic agencies."

As to the question of quarantine, the facts are not perhaps conclusive, yet they are too numerous and too important to be overlooked, and although certain breaks in the chain of evidence exist, there can be no doubt as to the general facts of the case.

The epidemic appears from the record to have radiated distinctly from two chief centres. Originating in the overcrowded barracks of Governor's Island, New York Harbour, in the immediate vicinity of an infected city, through which recruits passed with more or less delay before arrival, the infection spread by readily traceable steps to Hart's Island and other posts in the harbour ; to Tybee Island, Georgia ; to Louisiana, by way of New Orleans ; to Texas, by way of Galveston ; to Louisville, Kentucky ; to Richmond, Virginia, and to La Virgin, Nicaragua Bay. From Richmond it was carried to Norfolk, Virginia ; from Louisville to Bowling-Green, Kentucky. The probabilities appear to be that the disease was carried from New Orleans up the Mississippi

to various points on that stream, and west of it, and though the whole chain of evidence is not complete, yet there are a sufficient number of known cases of the transfer of the epidemic from one post to another, in this region, to put this view of the whole movement beyond reasonable doubt.

The other principal centre appears to have been Newport barracks, Kentucky, where the disease was plainly introduced from the infected city Cincinnati, on the opposite side of the Ohio River. It did not prevail to any great extent at this post, yet it is in evidence that it was carried thence to Augusta and Atlanta, Georgia, to Nashville and Memphis, Tennessee.

At several points, as for example at Augusta and Atlanta, Georgia, the epidemic did not extend beyond the infected recruits by whom it was imported. In many cases however it involved the rest of the community, and it is highly probable that this would have been the case far more generally but for the stringent hygienic precautions adopted.

As a particular example of the value of such precautions, attention may be appropriately drawn to the reports of Brevet-Major E. McClellan, Assistant-Surgeon, United States Army, from which it appears that cholera broke out at various points in the vicinity of Fort Delaware, in fact encircled the post, but did not invade the garrison, although one case, which recovered, occurred in the family of an officer on the island.

On the whole, it must be admitted that the general tenor of army experience of the United States during 1866

is strongly in favour of quarantine, and especially points to the danger to the army incurred by the distribution of recruits or other bodies of men from infected points.

Among these hygienic precautions, besides cleanliness, the use of disinfectants, ventilation, proper air space, and so on, especial attention is directed in the report of Brevet-Brigadier General J. A. McParlin, Surgeon, U.S. Army, to the efficacy of pure drinking water in arresting the spread of the disease, even after it has made its appearance. The troops exposed in New Orleans were by his direction supplied with cistern water (rain water) as far as practicable, and where this could not be obtained, distilled water was, in some instances, 'purchased by the quartermaster's department. The disease did not spread to any extent among the troops thus supplied; and the majority of the cases at New Orleans occurred in the detachments of the 6th United States Cavalry and 1st United States Infantry, and in the 81st Coloured, at times when these troops were so situated, for the most part, as to be obliged to use the water of the Mississippi River for drinking purposes. The interesting details of this important practical experiment will be found in the following extracts from the reports of Surgeon McParlin and of Assistant-Surgeon Hartsuff:

Whenever cistern water was not at hand, and could not be purchased, the quartermaster's department has procured distilled water for issue to troops. The supply at Jackson Barracks, at the barracks' hospital adjoining, and at the Sedgwick Hospital, Greenville, has been rain water in cisterns.

The troops at the barracks have enjoyed great immunity from disease. The 116th Regiment, United States Coloured troops, camped

near the Sedgwick Hospital, and supplied thence with cistern water, has continued entirely free from cholera. Quite recently on muster out of the 81st United States Coloured troops, the 116th was moved into quarters in the city (near Hunter Street). The supply of distilled and rain water for a day or so was scant, and some of the men used hydrant (river) water. Soon two cases of cholera occurred. Pure water was supplied, and there have been no more cases in the regiment.

The 9th Regiment, United States Coloured Cavalry, and the 39th United States Infantry, were supplied, but not sufficiently, with distilled water, until the cisterns at the Sedgwick were repaired, filled and furnished rain water to them. At first the distilled water sent up hot in casks, could not become cool before it was needed. The men preferred to drink the river water because it was cold, and did so against orders and repeated warning, accepting the risk of disease rather than wait for the water to be cooled and aerated. Case after case of choleraic diarrhoea followed. Critical inspection failed to develop any other probable cause except the use of river water, and a recommendation was made to move the regiments away from the river, far enough to prevent the men obtaining it. To avoid moving the cavalry put on a strong guard to keep the men from the river, and cistern water was supplied from the Sedgwick Hospital. Cholera since that has ceased in the regiment. The 39th United States Infantry has been moved to the ground adjoining the hospital (former healthful camp site of the 116th), and receives cistern water from the hospital. Its sanitary condition is good.

The 9th United States Coloured Cavalry kept part of two companies, guarding and attending to horses in the city, in old stables on Derbigny Street, second district. A few cases of cholera occurred among these men until they were restrained the use of hydrant water, and put into improved quarters elsewhere.

Circumstances have confirmed so strongly the importance of pure water, that even for troops in transit, remaining a few days, its supply is recommended.

The camps in Greenville were infested at one period with vendors of liquors, pies, and other deleterious articles, until orders were issued and enforced against them. *

* Report by Brevet-Brigadier General and Surgeon J. A. McParlin. Dr. Woodward's *Report*, Appendix, page 37.

The early history of the disease as it occurred in the 81st United States Coloured Infantry was precisely similar to that of the 1st Infantry described above. The occasion that demanded the services of the first, also required the 81st, who, in obedience to orders, vacated their comfortable quarters and bivouacked on the levee, where for a few days, they were subject to all the irregularities and privations consequent on a speedy change of quarters. Their food was badly prepared; their soiled linen was unchanged; their drinking water was from the dirty Mississippi; and to add to their bad condition, heavy and continued rains rendered their camp little better than a quagmire. These changes were so great and sudden that the previous good health of the regiment succumbed to their influence, and on the 3rd of August a large number were admitted to the hospital with cholera."

During the year 1867 cholera (A.) still existed in part of Europe, especially in Galatia, Switzerland, Dalmatia, Montenegro, Albania and Sardinia; but the epidemic of 1865 was now in its third year, and as is usual with the disease in all parts of the world, with the exception of its endemic area, it subsided rapidly over the countries formerly affected by it. In Russia for instance, Dr. Arkhangelsky informs us that only ten of the governments were affected by cholera in 1867, compared with 55 in the previous year. The disease declined over the continent of America, extending however to several points in South America, and it spread widely in the Argentine Confederation and in the towns on both banks of the Rio de la Plata. Buenos Ayres suffered very severely, as also did British Honduras.*

Turning to the east, we find that the cholera of

* *Army Medical Department Report for 1868.* Paper by Assistant-Surgeon Kearney, p. 317.

1864-65 had died out of Arabia, Egypt, and Mesopotamia in 1867, and the same remark applies to Asiatic Turkey, with the exception of cases reported as occurring in Suleimanich by the sanitary authorities of Bagdad. But in the north of Persia, as I have already remarked, there is strong presumptive evidence as to the extension of the disease either through the Bolan Pass in 1866 (in the same way as it was carried from Rajpootana westward to Agra) or through the Khybur pass, early in 1867, into Koordistan and the north of Persia; for we shall presently see that one of the most serious and rapidly diffused epidemics of cholera that had ever appeared in Hindostan spread over the whole of northern India in the month of May 1867, and consequently we find cholera breaking out in Teheran early in the summer of 1867, this being probably the reappearance of the cholera of the previous year; and then later on in the season, cholera having been fearfully severe in Peshawur, and having broken out with almost unprecedented violence in Cashmere and Afghanistan early in July, it appeared at numerous places along the road from Teheran to Meshed. The disease spread south of Teheran as far as Kashan; it also extended through the provinces of Amul, Balfurush and Sari into the Astrabad district, so that Europe was again threatened by cholera from the Punjab, Afghanistan and the north of Persia, during the year 1867, the western world being still affected to some extent by the epidemic which had spread over it *via* Egypt during the summer of 1865.

Cholera completely died out of Europe during the year

1868. It was true, some suspicious cases occurred at Kiev in Russia; but Dr. Arkhangelsky states "it is probable that the cases in question were really not of specific origin,"* a conclusion in which any one who takes the trouble to study the circumstance of these cases will certainly agree.

In closing this chapter on the history of epidemic cholera, I may observe that the outburst of the disease which spread from India to Arabia and Egypt in 1865, terminated throughout Europe at the close of the year 1867. In Africa the disease extended through Abyssinia into Central and Southern Africa, appearing on the eastern coast in 1868, and reaching Zanzibar in 1869. We find that cholera for the first time in the history of the disease broke out on the west coast of Africa in 1868. We know that the disease prevailed in the French settlement of St. Louis, in Senegal, in November 1868, according to the *Lancet* of September 25, 1869. "The hypothesis is, that it spread from Egypt or Arabia to the Moorish and other tribes inhabiting the northern and north-central continent, who, by caravans travelling from these parts, conveyed it to St. Louis. Cholera is said to have broken out there immediately after the arrival of a Moorish trading caravan." We pass over the history of the introduction of the disease into McCarthy's Island in March 10th, to glance at its advent into Bathurst. A woman returned from the former to the latter place about the 3rd or 4th of May, notwithstanding the quarantine,

* Mr. Netten Radcliffe's "Report on Cholera." *Report of Medical Officer of the Privy Council*, no. v, p. 82.

died of cholera. This was the first case that had ever occurred in Bathurst. This woman's family were next attacked, and several of them died; from that time the disease extended and carried off 1,700 victims out of a population of about 5,000 souls. Cholera spread southward along the west coast of Africa, and also extended into the interior of the country.

The epidemic cholera of India 1864-65 was not so severely felt in Persia as some other outbursts of the disease had been, and before it had absolutely disappeared the north of Persia was again invaded by the disease, probably from Western India, and most certainly from the Punjab *via* Cabul in 1867. It will be my object in the following chapter to trace out the details of this fresh outburst of cholera from India into Persia and Europe.

CHAPTER XI.

CHOLERA IN INDIA DURING THE YEAR 1864-65, AND ITS APPEARANCE IN THE NORTH OF PERSIA AND EUROPE IN 1868-70.

IN 1865, cholera was reproduced in a virulent form in the central provinces and Bombay (p. 286), but Bengal proper was comparatively free from the disease during this period, and the Punjab equally so; there were in fact only four cases and two deaths in this latter province, among a European force numbering some 14,000 men.

During the year 1866 cholera was again on the increase in Bengal Proper and Behar. Among the prisoners confined in the jails of these provinces there were no less than 1,455 cases, and 635 deaths from cholera, out of an average strength of 20,353 convicts. In many of the districts of Lower Bengal, especially those affected by famine, the mortality from the disease among the prisoners was very great indeed; for instance at Raipore the death-rate was 100 per 1,000; at Cuttack 132 per 1,000, and no less than 368 per 1,000 at Chyabassa. Fearful as is this death-rate it was probably trifling in comparison

with that which prevailed in the same districts among the civil population.

With the exception of one case of cholera in the Agra jail, the prisons in that province, as well as those in Meerut, Rohilcund, and the Punjab, were absolutely free from cholera throughout the year.

We may here revert to the prevalence of famine and cholera in Orissa at this period in connection with the amount of rainfall, as contrasting with the condition of the North-west in 1861. I have attempted to show that, so long as the drought of 1860 lasted, cholera did not invade the famine-stricken districts. It may be asked, why then did the disease spring up in the famine districts of Bengal in 1866? The commissioners appointed to inquire into the Bengal famine report that "the natural cause of the scarcity and famine may be stated to be simply the premature cessation of the rains of 1865, throughout the Lower Provinces of the Bengal Presidency, in the middle of September 1865. Speaking generally, it may be said that no rain of any consequence fell after the middle of that month. A portion of the Madras coast to the south-west of Bengal was similarly affected."

The total amount of rainfall for the year was not unusually small in most of the districts of Bengal, but it fell abnormally and out of time. For instance, at Pooree, although no rain fell in January or March, there were nearly four inches in February and six in April; the total quantity of rain for the year was seventy-seven inches. In the Midnapore district, rain fell during every month of the year, 113 inches in all; in February 1866 cholera

appeared at Pooree, it continued till March, and again reappeared in August and September, during which months an unusual amount of rain having fallen, half the district was inundated. When the heavy rains ceased in September the outbreak of cholera passed off. It is evident therefore that the season, particularly as regards the rainfall in Bengal during the year of famine and cholera, was very different from that of the north-west drought and famine year without cholera.

Although the prisons in the provinces of Agra, Meerut, and the Punjab, were free from the disease in 1866, cholera appeared among the troops and civil population towards the close of the year.

From the commencement of the rains of 1866, cholera had been more or less prevalent in several of the Rajpootana States ; Jodhpoor had suffered severely, and the Governor-General's agent, on his way from Aboo to the Agra Durbar, was obliged to march out of the ordinary route in order to avoid the infected districts. He arrived at Halena, a village in the Bhurtpore district, on the 8th of October 1866, and halted the following day, continuing the march on the 29th towards Agra. Two cases of cholera, the first which occurred in the agent's camp, proved fatal on the morning of the 26th. His party then marched in two divisions towards Agra, halting the main portion of his camp at the village of Buronda, ten miles from Agra, on the 2nd of November. On the following morning, the agent took his personal staff and office establishment into the cantonments. Agra was at this time absolutely free from cholera, but about noon on the

4th of November the disease appeared in the agent's camp, and a few hours afterwards reappeared in a virulent form in the main encampment at Buronda. It subsequently gained a footing amongst the European and native troops, during the Viceroy's Durbar, and also in the city of Agra.

The disease continued to follow some of the regiments on their march to their various destinations : notably, the 36th Native Infantry, *en route* to Meerut, suffered after leaving Agra ; among the native troops in camps, and on the march in the Agra and Meerut districts, during the months of November and December 1866, twenty-eight cases of cholera occurred in all, of which nineteen were fatal. In December there were two fatal cases in 2nd battalion, also one in the Royal Artillery at Delhi, and one in the Sappers and Miners at Roorkee, both of which recovered.

Among the general population it is difficult to determine to what extent cholera prevailed at this time, but from the Punjab returns it is evident that the disease existed to a considerable extent in the Delhi district after the Agra Durbar, and also at the Goormooktesur fair ; and two deaths occurred from cholera on the 4th and 23rd of December at Roorkee, which is close to Hurdwar.

Further, Dr. J. Murray informs us that, during the cold season of 1866-67, the disease prevailed along "a belt of land skirting the Terrai, at the foot of the Himalaya Mountains. In February, cholera was prevailing in the Terrai villages, in the vicinity of Nainee

Tal, and extended, skirting the hills in a westerly direction, in March. From the 5th to 12th of April there were nineteen cases in the village of Bazpore, which is sixty miles to the east of Hurdwar; and from this place doubtless pilgrims went to Hurdwar." *

We have therefore, in the above history, abundant evidence to show that cholera having been imported from Rajpootana into the mass of people congregated at the Governor-General's Durbar in Agra, during the month of November 1866, the disease had subsequently extended, with the troops and camp followers, over the North-west of India and into the Punjab, appearing close to Hurdwar in December; and further, that it had been generated more or less constantly throughout the cold season of 1866-67 among the inhabitants of the Terrai, in fact up to the very time of the Hurdwar fair, and it is well known that numbers of people from the infected districts visited Hurdwar. Cholera was very prevalent at Allahabad and Benares in March 1867, and a considerable concourse of people from these places were also present at Hurdwar. Lastly, the disease had not died out in the Bhurtpore territories during the cold weather; it certainly existed there in February and March; the Rajah of Bhurtpore, with a large retinue, visited Hurdwar; supposing, therefore, cholera to be a communicable disease, we can hardly wonder at its having broken out among the multitude of pilgrims assembled at Hurdwar in April 1867.

* *Report on the Hurdwar Cholera of 1867*, p. 3. By Dr. J. Murray.

In the following history of this outbreak of the disease, I shall follow closely the published reports on the subject by Dr. J. Murray, and the late Mr. H. C. Cutcliffe; the latter gentleman was at the time sanitary officer in charge of the Hurdwar fair; he commences his report by informing us that the town of Hurdwar is situated on the bank of the Ganges, in a gorge of the Sewalick Hills, about thirteen miles from where the river escapes from the Himalaya. The elevation of the place is about 1,000 feet above the level of the sea. The hills on which the town is situated are of tertiary formation, and are composed of massive strata of grey sandstone, covered in parts with a superstructure, either of clay or loose boulder gravel. Cholera had been unknown at Hurdwar during the nine years prior to 1867.

The encamping ground at Hurdwar consists of a narrow slip of land, nine miles long by three broad, with the river running through the middle of it. Dr. Cutcliffe considers that some twenty-two square miles were occupied by the camp, containing nearly three million pilgrims. The very best possible arrangements had been made with regard to the sanitation of this prodigious encampment.

With regard to conservancy, the rules laid down by Dr. Cutcliffe were,—1st, That the principle of dry earth conservancy should be everywhere adopted.

2nd, That all filth, from whatever source, should be as quickly as possible disposed of, either by (a) burying it in trenches, or (b) burning it in furnaces, *i.e.* by rapid combustion.

3rd, That decently screened latrines should be provided in situations convenient to the people.

4th, That no latrine or trench should on any account be made on ground that at any time could form part of a watercourse.

That dead bodies of animals, should be speedily buried in graves of six feet deep, in grounds selected with similar restrictions.

“The pilgrims began to pour into the camp from the 1st of April in vast numbers from the plains, and to settle themselves down in the blocks laid out for them. On the 3rd of April the fair may be said to have commenced, though dense living streams stretched backwards for a very long distance into the plains, and with a volume steadily increasing up to the auspicious bathing hour of noon on the 12th of April, continued to concentrate themselves in Hurdwar, and to pour out their multitudes on the encamping ground.” It is important to notice here that, on the night of the 11th of April, a very heavy thunderstorm burst over this vast unsheltered multitude; the rain lasted the whole of the night and throughout the following day.

Those only who have been exposed to these hill storms in the tropics can realize what a night of misery these three million pilgrims must have passed on the open plain of Hurdwar, cold and drenched to the skin, the water running in streams off their half naked bodies over the rocky ground into the river; and however perfect the conservancy may have been, this downfall of rain must inevitably have washed excrementitious matter from the

latrines and surface soil into the Ganges, during the night of the 11th of April.

With the exception of a case of cholera on the 9th, under the care of Dr. Kindall, the entire mass of pilgrims appears to have remained in good health up to the 12th of April, and I cannot do better than describe what then occurred in Mr. Cutcliffe's own words. He says, the bathing place of the pilgrims was a space 650 feet long by 30 feet wide, shut off from the rest of the Ganges by rails, which prevented the people from getting out into the river further than the limits of the space thus enclosed. Into the long, narrow enclosure, the pilgrims from all parts of the encampment crowded as closely as possible, from early morn (the rain still beating down over them) till sunset. The water within this space during the whole time was thick and dirty, partly from the ashes of the dead, brought by surviving relations to be deposited in the water of their river god, and partly from the washing of the clothes and bodies of the bathers. Now, pilgrims at the bathing ghaut, after entering the stream, dip themselves under the water three times or more, and then drink of the holy water whilst saying their prayers. The drinking of the water is never omitted, and when two or more members of a family bathe together, each from his own hand gives to the other water to drink.

Observe what follows : on the evening of the next day, 13th April, eight cases of cholera were received into one of the hospitals at Hurdwar. By the 15th the whole of this vast concourse of pilgrims had dispersed, and the encamping ground was again left a barren waste. Dr. J.

Murray has given us a careful report of the events that occurred after the pilgrims left Hurdwar ; his knowledge of these localities, and his great experience in matters of the kind, enabled him to trace the pilgrims along the various routes they took on their return homewards from Hurdwar.

He states that the immense crowd at Hurdwar having entirely dispersed by the 15th (cases of cholera had occurred among them on the 13th before they left), the pilgrims

passed, at a favorable season of the year, through a healthy country ; supplies were abundant, and extensive arrangements had been made for their convenience. They travelled chiefly on foot, and slept in the open air or under trees. Some had camels to carry their luggage, and there were a great many bullock hackeries and bhylees, which carried families with their supplies. The ordinary rate of progress was from fifteen to twenty miles a day. A few travelled quicker by horse dawk carriages, and many continued their journey by rail after reaching Gazeabad and Umritsur. The moving mass crowded the road in a continuous stream for nearly a week at Meerut, where I remained to watch them. This pilgrim stream carried with it cholera, which lined the road with victims, whose funeral pyres studded the surrounding fields, or whose corpses were thrown into the canal, or collected by the police and buried. The disease was communicated to the neighbouring towns and villages, and the pilgrims carried it with them to their houses, over the whole of Hindostan.

Dr. Murray continues, there were cases of cholera on the 13th April at the first stage on each of the four main lines of road from Hurdwar ; 1st, at Bajwanpore, twenty-three miles from Hurdwar, on the way to Mooltan, to the west ; 2nd, at Roorkee, nineteen miles on the road to Hissar and Jeypore, to the north-west ; 3rd, on the third line of road *via* Meerut to Allahabad, to the south ; 4th, at Nujeebad, fourteen miles on the road *via* Bijnore, skirting the Himalaya Mountains towards Oude, to the south-east.

It really seems almost impossible to have clearer evidence than Dr. Murray's tables afford, as to the fact of cholera having been disseminated throughout the country by means of the infected pilgrims. He says that, in the reports he received on the subject from medical and civil officers, there are numerous illustrations of the manner in which the disease was transmitted to families by the arrival of relatives; to people of villages communicating with pilgrims; to those who ate the food of the pilgrims, or travelled in the same carriages with them, and were afterwards affected by the disease. He traced cholera in this way south-eastward to Shajehanpore, on the 24th of April, and so on into Oude; southward to Allyghur, on the 20th of April; northward as far as Simla; and to the north-west, right away to Peshawur, and so into Cabul. The disease reached Peshawur on the 11th of May, and in the opinion of the civil surgeon, "was due to importation; no cases having occurred in the place for years, and not until after these Hurdwar pilgrims had arrived." He adds, "Although the time of incubation was limited, I think there can be little doubt on this matter; I hear the mortality among these pilgrims on their way up was severe." It was ascertained that 548 men, women, and children left Peshawur for Hurdwar, and 524 returned, 24 having died of cholera or other disease on the road; besides which, Peshawur was on the high road to Cabul; between which country and Hurdwar great numbers of pilgrims went and returned.

The circumstances of the first case of cholera in

Peshawur are clearly given by Sub-Assistant Surgeon Cheytur Shah, the patient having been one Shunken Doss; the case occurred on the 11th of May, and the disease was epidemic in the city by the 21st of the month. Cholera spread to the European troops in the cantonments, the first cases being reported on the 20th of May, and did not cease until it had carried off ninety-two men out of a force of some 2,511 troops.

The epidemic of 1867 did not cease at Peshawur, for it crossed our frontier into Cashmere and Afghanistan; in this latter country it broke out with fearful virulence early in July, and continued until the month of September. No less than 8,000 persons are said to have died from cholera in the course of one month in the city of Cabul; and the disease spread to all the surrounding country. The bazaars were closed, and the people fled in a state of panic into the country. This circumstance probably accounts for the appearance of cholera during the summer of 1867 at Teheran, where it was reproduced in the autumn of 1868. In a work which I published on the subject of Asiatic cholera in 1869, referring to the progress of this epidemic of cholera, which was then extending from India into Persia, I made the following remark:—“Europe therefore, is threatened at the present time with the disease *via* Russia and Turkey, and also from Central India and Bombay, for cholera was very severely felt in many parts of the Central Provinces last rains; it appeared in Bombay towards the close of the year, and early in 1869 has again been heard of in that presidency, par-

ticularly in the districts about Mhow."* And it will be seen that this idea was verified by the subsequent history of the disease; for (p. 338) cholera broke out at Meshed, Teheran, and the north of Persia in the summer of 1867, and in the following year the disease was very prevalent over the greater part of Persia. We are indebted to Mr. Netten Radcliffe for the particulars of this outbreak of the disease.† During the month of February 1868 cases of Asiatic cholera were reported from various towns in the province of Mazanderan; and in April the disease was very fatal on the road from Meshed to Astrabad, and in fact at numerous points along the high roads from Herat to the north-west of Persia. Cholera broke out at Meshed when it was crowded with pilgrims in July, and was carried by these people to Khaf, Birjand, Yezd, and Kirman, and westward to Hamadan and Ispahan; northward it extended as far as the River Attrek.

The disease occurred with considerable force during the year 1869, over those parts of Persia visited by it during the previous year; it reached as far south as Shiraz. To the west it broke out at Kirmanshah; and crossed the Turkish frontier into the district of Khalis. In the north-east cases were reported from Kasbin, Tabriz, and Tadjirsh. At the same time Asiatic cholera made its appearance in the town of Kiev, the "Jerusalem

* *A Treatise on Asiatic Cholera*, p. 251. By C. Macnamara. London, 1870.

† Mr. Netten Radcliffe "On Cholera." *Reports of the Medical Officer of the Privy Council*, new series, no. v, 1875; p. 118.

of Russia," * at a time when the place was full of pilgrims (in July and August 1869), and from this locality it spread to the surrounding districts, some 1,276 persons being attacked by the disease, and of these 620 died. It is impossible to trace the connection between this outbreak of Asiatic cholera in Russia, with that which had spread from India into Persia in 1867-68; but we must bear in mind the fact that in 1867, the railway from Poti to Tiflis had been completed, and from that port to Odessa there was rapid steam communication. From this latter place to Kiev a line of railway had been opened in 1869; so that at the time of the outbreak of cholera above referred to, there was constant communication between the infected provinces of Persia, and Kiev. The *Lancet*, however, of August 27th, 1870, reports that "in August 1869 an outbreak of cholera occurred at Reshed at the foot of the Caspian Sea, and a little latter at Astrabad in the south-east corner, whence it could easily have been carried up into Russia by the weekly steamers to Baku and Astrakan, and from thence up the Volga to Nigni Novgorod. In September 1869 it broke out at this latter place after the great fair in July and August, to which over 200,000 merchants come from all parts of Russia, Persia, and Central Asia, and other places accessible." This idea was confirmed by a report published in the *British Medical Journal*. "At Constantinople the opinion is entertained, based on documents, that the Russian cholera of 1869 and 1870 was due to importation from Persia. The disease is declared to have broken out at Nigni

* Mr. Netten Radcliffe's "Report on Cholera," p. 21.

M. Frank's account of the late epidemic of cholera at Munich ; * he remarks that during the year 1873

in the province of Dantsic the same introduction of cholera by the traffic on the Vistula or Nogat was observed ; those parts which were most removed from this traffic almost entirely escaped. Hirsch says, the first cases among the inhabitants were observed in the beginning of June in several cases lying on the banks of the Vistula or Nogat where diseased raftsmen were taken, and thus in the middle of June the disease acquired simultaneously an epidemic character in many points ; the importation of the cholera on one side by the Galician raftsmen and on the other from the neighbouring parts of the district of Marienwerder, as also the later introduction of the disease from place to place in the province of Dantsic, was made out with certainty in every single case." (p. 10.) In many places the disease was very severe, even close to the city of Dantsic (as in Heubude and Strohteich), yet Dantsic itself had a "relative immunity." As noted in last year's report, in former cholera periods Dantsic had suffered most severely ; in 1873 it was almost spared. Last year I stated the presumed cause of this exemption, and Hirsch also alludes to the improved water supply and the new sewers, and adds a remark that most cases that did occur, and especially when many occurred in one house, were in those houses in which there still remained the old privy and night-chair system. Nevertheless he wishes to express himself with great reserve on this point, as there were many other unhygienic places in which the cholera showed very little intensity.

After giving these details at some length, Hirsch proceeds to formally state the mode of spread of cholera.

1. Spread through the traffic of men. He says the fact is confirmed on all sides that the introduction of cholera into Prussian Poland and Prussia was by the Galician raftsmen, and that this was "invariably" the case. Then from the towns or villages where the cholera was thus introduced, and where it spread epidemically in some cases, it spread to places lying far from the river by inland traffic. "The introduction," writes Hirsch (p. 15), "was proved

* *Army Medical Department Report for the year 1873.* "Report on Hygiene for the Year," by Professor E. A. Parkes, p. 202.

with certainty to be either through inhabitants of the place who had been attacked with cholera in other infected places, or through sick persons who had travelled to the place, and everywhere the course of the disease from an individual to his neighbours could be followed."

2. Spread through dead bodies, linen, clothing, and straw. The carriage by dead bodies seemed probable, while that by clothing and straw was undeniable. With regard to soiled clothes he mentions the following case: The clothes of a raftsmen, dead of cholera, were stolen and taken to the house of a poor family in the village of Cruczno; the woman of the house and her child sickened with cholera; they were the first cases in the village, and from them proceeded a murderous outbreak. In a village near Culmsee there died all the inhabitants of a house into which linen from a cholera patient dead at Culmsee had been brought. After thorough purification of this house, no more cases occurred in that village. Two other similar cases are given.

With regard to straw, Hirsch speaks with some doubt, but refers to some apparent instances, and thinks it a matter to be carefully looked to.

3. Spread through drinking water. Hirsch seems to have no doubt of the influence in spreading cholera of impure drinking water, but he still thinks it not decided which of the following views is correct, viz. :—1st, whether the impure water contains something *specific*; or 2ndly, whether the water merely exerts an injurious influence which *predisposes* to an attack. He relates several instances which certainly seems to give greater weight to the first explanation than the second.

Dr. Parkes observes that with regard to the report on the cholera (A.) in Munich during the year 1873—

The most important part of Dr. Frank's book is that, however, in which he deals with the ground-water hypothesis of Pettenkofer. He speaks of Pettenkofer with the greatest respect, but honestly states that the careful measurement of the ground-water gives no support to his favourite theory. He remarks first that the variations in the level of the ground-water from the year 1856 until now are too

unimportant to be able to account for the putrefactive processes in the ground, and he adduces various reasons for this opinion. Passing, however, to the actual facts of 1873, in January the ground-water was relatively deep; it rose in March, and on the 30th June was higher than it had been for a long time. At that time the cholera commenced; the ground-water fell a little in July, but rose again in August, so that on the 27th August it stood at its highest point; but while it was thus rising the cholera was at its greatest intensity; from the 27th August the ground-water fell continuously until November and during all this time cholera declined, while according to Pettenkofer's theory it should have increased; on the 19th November the ground-water began to rise, and exactly at this time cholera again increased, and reached a second acme; in January the ground-water fell, cholera was less than in December, but still was more than in October and November. In fact, not to go into details, it seems certain that no connection could be maintained between the changes in the ground-water and the cholera cases, and Pettenkofer's hypothesis has thus received a severe and perhaps fatal blow in the very place where the evidence was supposed to be most favourable to it.

Cholera (A.) however broke out in Asia Minor in August 1871, and in November some few cases occurred in and about Constantinople. From Russia the disease passed as I have already remarked into Prussia in July, and in September we hear of it at Hamburg and also in Finland.

The steam ship "Franklyn" left Stettin on the 10th October and "Christiansand" on the 23rd; eight days afterwards the first death occurred on board, and before reaching Halifax on the 6th of November, some forty of the emigrants on board this vessel had died. On the very day the "Franklyn" arrived at Halifax, a man named Melvin went to work on board; he died of cholera on the 14th of November. Another man

Lepier was also employed on this ship during the 9th of November; on the 13th he was attacked with cholera, and in this condition was carried to his father's house at Chezet-Cook. No less than three of this man's female relatives while attending on him contracted the disease. Directly the circumstances of the case became known the locality was placed under the strictest quarantine. Sentries were placed all round the village, and the greatest care taken to destroy the clothes, bedding, and everything belonging to this unfortunate family. The disease did not spread.

In 1872 cholera broke out in Vienna and other parts of Austria, Hungary, the Roumanian Principalities, Prussia, and Belgium—in fact it was very widely diffused over Europe. The disease was imported into England on several occasions, but the local sanitary authorities by their admirable arrangements stopped the further diffusion of the malady, and so the country was saved for the time from the effects of the terrible disease. During the year 1873 Asiatic cholera began again to subside in Europe, though it still existed in Russia, the Netherlands, and at Munich, throughout the winter and on into the spring of 1874.

While cholera was extending from Persia *via* Russia to western Europe in 1869-70, it was also spreading from the former country into Central Asia, or it may be that the disease was disseminated from Afghanistan or Cashmere; at any rate Asiatic cholera made its appearance in the city of Balkh during the year 1871, and at Bokhara in the following year. Mr W. D. Mitchell, writing to the

Lancet of 9th November 1872, remarks that cholera in its epidemic form, first broke out in the Russian province of Turkestan, Central Asia, in the middle of April, appearing next, on the 11th June, farther south, on the northern side of the mountains forming the northern boundary of Bokhara. It next made its appearance in the beginning of July at Kokand on the Iaxartes, north-east of Bokhara, also showing itself at the same time among the native population and among the Russian troops in Samarkand. The Russian Military Medical Inspector, Mr. Suvorof, at once pronounced it to be "Asiatic malignant cholera." He considers that the epidemic comes from a Persian or Indian central source. On the 30th June it broke out in Tashkend, 213 cases out of 400 terminating fatally in the first four days. In Themkend, north of Tashkend, it appeared on the 13th July, and spread thence, day by day as it were, down the Iaxartes to all the Russian forts on that river to the Aral Sea. In Tashkend alone, from the date of its appearance, 30th June, to its subsidence, there were 3,267 cases and 2,261 deaths in a population of about 40,000. The medical inspector has reported the entire cessation of the epidemic on the 26th August. About 4,000 deaths he reports to have occurred for the period 10th April to 26th August 1872. About the middle of August cases of cholera broke out among a body of recruits brought from the interior of European Russia and landed on the north-east coast of the Caspian. Also at the same time, we learn from India and other sources that the Khanate of Bokhara became invaded, culminating in a fearful

explosion of the epidemic in the city of Bokhara, where by the first week in September the deaths are reported to have reached to even 1,000 to 1,200 a day, happily fast subsiding by the middle of October.

From Persia Asiatic cholera also spread in 1870-71 into Arabia and Nubia. On the 19th of June the disease appeared at Haiel in Northern Arabia, into which place it was reported to have been introduced by pilgrims from Medjef where the disease existed. Cholera spread along the caravan route to Medina by way of Khaiber and then infested the Bedouin tribes; it was also carried on the 21st of October to Mecca, and was introduced by troops marching from that place to Confodah; the disease was carried by soldiers into Hodeida in March 1872. Cholera hung about Mecca, though in a subdued form, until the pilgrims assembled there in 1872, when it broke out among them, and was dispersed along the route they traversed by Medina.

During the year 1873 Asiatic cholera appeared in New Orleans, in February, and afterwards appeared in numerous localities along the course of the Mississippi. A most valuable work, written principally by Dr. J. C. Peters, of New York, and Dr. Ely M'Clellan, U.S.A., on this outburst of cholera has been issued from the Surgeon-General's office, War Department, Washington.* From this report we learn that Dr. Van Buren Hubbard, U.S.A., was deputed to examine into the circumstances regarding the first outbreak of the dis-

* *Cholera Epidemic of 1873 in the United States.* Washington Government Printing Office, 1875.

ease at New Orleans in 1873, and he reports that prior to Asiatic cholera appearing in the town, vessels had arrived from Jamaica, into which island the disease had been imported on more than one occasion by coolies arriving from Calcutta; and that during the latter end of 1872 a large number of emigrants had arrived in New Orleans from cholera-infected districts. There was no reliable quarantine to guard the city from the disease; and further, cholera broke out in precisely those localities where emigrants arriving from infected localities had been lodged.* On referring to the reports of the Government Emigration Agent in Calcutta, I find that on the passage from India to Jamaica deaths from cholera had occurred on board the "Sea Queen," which arrived in Jamaica on the 2nd December 1872, and also on board the "Humber," which vessel arrived in the island on the 9th September. In vessels containing coolies sailing from Calcutta for Demerara during the year 1872 there had been severe outbursts of cholera, on board the "Poonah," and "Kate Killock"; the latter reached Demerara on the 12th November 1872, and lost no less than fourteen coolies from cholera between the eighth and fifteenth day after leaving Calcutta. The "Poonah" lost seventeen coolies from cholera between the thirteenth and fifteenth day after leaving Calcutta. It is evidently time the American authorities moved in this matter, and endeavour, as far as possible, to protect themselves from the importation

* *Cholera Epidemic of 1873 in the United States*, p. 109-111. Washington, Government Printing Office, 1875.

of cholera directly from Calcutta into the Southern States. There can be no question as to the importance of the subject from an American point of view, as the following account will illustrate:—

The English ship "Forfarshire" was visited while on her voyage from Calcutta to New York, *via* Demerara, with a cholera epidemic. She left Calcutta in August 1864, and arrived in Demerara with 510 coolies on the 5th November. The cholera broke out the second day, the germs of the disease undoubtedly having been brought on board ship, the first person attacked being a woman. The next day other cases developed themselves, principally among the women, and they were placed in the hospital on deck, quarantined from the other coolies, who were apparently in good health. On the third day a young man, then a boy and two children, were attacked, and the disease triumphed over all attempts to stay its progress. Within ten days as many as forty coolies were suffering from cholera. Previous to this the deaths averaged one a day. The third day the mate and the apothecary were attacked, and narrowly escaped with their lives. The engineer employed on board to distil water died. In five days fourteen deaths took place, and it looked at one time as if every soul on board would be attacked. The majority of the deaths were those of children who had not the stamina of the parents.*

In addition to the deaths which occurred from cholera on board the "Forfarshire" of the coolies sailing from

* *The Medical Press and Circular.*

Calcutta for Demerara during the year 1873, I find that on board the steamer "Emnor," which arrived at her destination on the 25th August, ten coolies died from cholera; the "Golden Fleece" reached Demerara on the 30th November, and lost six persons from cholera; the "Sir H. Lawrence" and "Hereford" had respectively twelve and three deaths from cholera on board during the voyage from India to Demerara. What became of these vessels, or of the "Lochlomond"? concerning which I have the following report by Charles Grey, Lieutenant, R.N. :—

"The coolies embarked in excellent condition at the usual place—Garden Reach, Calcutta—on the evening of Monday, 26th January 1874. As they passed on board after final inspection, each adult received a ration of biscuit and sugar, and each child some milk, besides having their tin pots filled with fresh water from the hydrants. There was a good deal of confusion amongst them for the time, until each found their places. They were berthed in the usual way—viz., the single women aft, then married people, and forward of all the single men—an arrangement difficult, if not indeed impossible, to keep up where there are no bulkheads; however, there was very little trouble on the score of the different classes mixing during the voyage.

"The weather at the time we started was anything but favourable—damp foggy nights, and hot sultry days; the day previous to embarkation was wet, cold, and miserable, and the coolies in the depot were more or less exposed to it, as there is no individual shelter; however,

they were sheltered as far as possible by Captain Eales. The vessel was taken in tow the following morning, 27th January, and proceeded down the Hooghly, *en route* to sea. A good deal of despondency prevailed. The ship anchored off Diamond Harbour for the night.

"28th. January.—Proceeded on, getting to sea at 5 A. M., when pilot left. Several cases of diarrhoea were noted during the two days proceeding down the river.

"29th January.—A case of sudden death occurred. A man was seen to drop down at one of the latrines, and when picked up was found to be dead. Inquiry elicited that he had been ill for days on shore from diarrhoea, and had concealed the fact for fear of rejection, and consequent separation from his comrades. Many such cases of diarrhoea occurred. Children were found to be suffering from the disease to an alarming degree, wrapped up in their blankets by the parents. Such results, I believe, are in consequence of confusion consequent on change to shipboard, and not knowing where to go or what to do. These cases occurred chiefly amongst the 'junglees'—a stupid race always. The emigrants suffered much from sea sickness, the women particularly, amongst whom it procured or induced two cases of abortion. Every effort to keep them in spirits was made. Drums, concerts, single sticks, trials of strength, &c., every evening in the dog watches. I am sorry to have to record in the annals of a voyage otherwise a happy one, the invasion of cholera, which made its appearance when we were some ten days out from Calcutta.

“On the 4th February, our ninth day after embarkation, a sailor was attacked by the disease, and died after a few hours’ illness; this was followed by four others (sailors) before a case was noted amongst the coolies, among whom it began on the evening of the 6th. We had in all twenty-six cases—viz., five sailors and twenty-one coolies, of whom two of the former and eleven of the latter succumbed to the disease. I am at a loss to account for the outbreak; the ship was kept scrupulously clean.”

I have already remarked that cholera (A.) spread widely along the valley of the Mississippi during the year 1873, and I have given evidence as to the probability of its having been imported into New Orleans by coolie vessels arriving from India; but Dr. Y. N. Woodworth, Supervising-Surgeon of the U.S. Marine Service, in his very able report on this outbreak of the disease, remarks that—

“in 1873 three distinct outbreaks of the disease occurred at widely remote points of the U.S., from poison packed and transported in the effects of emigrants from Holland, Sweden, and Prussia. These people and the vessels in which they were carried had been perfectly healthy, and the people remained so until their goods were unpacked at Carthage, Ohio, at Crow River, Maine, and at Yankton, Dak., respectively. Within twenty-four hours after the poison particles were liberated the first case of the disease appeared, and the unfortunates were almost literally swept from the face of the earth.

“These instances, which might be multiplied, sufficiently demonstrate that no amount or character of inspection of persons alone will suffice to prevent the importation of cholera to this country while the disease exists in the European continent as it has been for the past

ten years, and as it is likely to be, owing to the increased facilities of intercourse with India." *

The following is one among numerous instances related in the American Report for 1873 of the means by which the disease extended along the banks of the Mississippi :—

On the 15th or 16th of April the first case of cholera occurred in Memphis, but it did not become epidemic there until some weeks later.

The steamboat "John Kilgour" left New Orleans on the 13th day of May 1873, at which date cholera was quite prevalent in that city. The "Kilgour" had a considerable number of deck or steerage passengers on board, most of whom were flat-boatmen from different places along the Mississippi and Ohio Rivers who had been down with produce and were returning home. The cholera broke out on the "Kilgour" the next day after she left the port. The first victim was Mr. John Schenck, who resided about nine miles from Cincinnati. Mr. Schenck died near Vicksburgh. His body was sent home from Memphis by railroad, in an air-tight casket. Mr. Schenck's baggage was brought to Cincinnati by the "Kilgour," and there delivered to his friends. The body was buried without the casket having been opened or taken into the house. Three of the "Kilgour's" deck-passengers died of cholera during this trip; one was buried near Shawneetown, one near Rome, and one near Evansville. Two of her passengers went ashore at Memphis, and one at Paducah with choleraic diarrhoea. When this boat arrived at Mount Vernon she was unable to land at the wharf-boat on account of the low stage of the river, and she effected a landing a short distance above the wharf, where one of her deck-passengers went on shore sick, as was believed, with symptoms of cholera, and entered the house of a Mr. Russell, situated near the place of landing. The next day Mrs. Russell was attacked with cholera and died. A number of her relatives, residing in the country a short distance

* *The Epidemic Cholera of 1873 in the United States.* Report by Dr. Wordsworth, p. 10.

from Mount Vernon, who visited her while sick and attended her funeral, subsequently took the disease, and among whom a number of deaths ensued at their respective residences.

From these cases the disease was carried back again into the town of Mount Vernon, and thus originated the fearful epidemic which swept over that place.*

The Second Cholera International Sanitary Congress was opened in July 1874 at Vienna, by Count Andrassy, who was mainly instrumental in bringing it about. The first of these sanitary conferences was held in 1866 in Constantinople, and although much valuable material was collected at the time, the experience of the past eight years, above all that of the last two years, proves that a mere scientific discussion was in this case but little adapted to lead to practical results. There was the great difference in principle as to infection from cholera, which led to the most different applications of quarantine measures in different countries. Each Government went on in this respect quite independently, introducing often at a moment's notice, or even without any warning at all, arbitrary and stringent measures. Often on the merest rumours the intercourse on one or the other international road line was practically stopped, to the great annoyance of travellers and equal detriment of commerce. Above all in the seaport stations the inconvenience was most intensely felt, and on the large arteries of the traffic eastward. And yet there is not an instance in which it can be shown with anything like plausibility that safety from

* *The Epidemic Cholera of 1873 in the United States.* Report by Dr. W. Clendenin, p. 347.

cholera was due to these measures. Indeed with the grand facilities of communication in all directions, unless a state is prepared to shut itself up hermetically against the whole world, it cannot prevent importation in a round-about way.

All these inconveniences induced the Austro-Hungarian and Russian Governments to start the idea of another International Sanitary Conference, in which all the states of Europe and the adjoining states of Persia and Egypt, were invited to participate. As there was no question of any political treaty, the vassal states of Turkey, which by their geographical position are of great importance in carrying out any common agreement, could not be set aside, and they are represented like the suzerain state. Equally so the political separation as to internal affairs of Norway and Sweden, and Austria and Hungary, was taken into account, so that each of the component parts of these two states is represented.

The main object of the congress was to draw up general quarantine regulations, and to establish an international organ which should assist those isolated efforts made hitherto to trace back the cholera epidemic to its source, and to follow it through all its phases. What the isolated efforts could not effect, Count Andrassy believes may be effected by united effort.

In order to facilitate and expedite the work of discussion the conference formed a short programme of rules and orders of discussion, which was accepted *en bloc*, and a detailed programme of questions under four heads.

Under the first head come a number of preliminary questions about the origin, nature, and the infectious character of cholera. Under the second head come the questions relating to quarantine. Then come under the third head the questions about an International Epidemic Commission—viz., whether there are to be permanent or temporary international stations for the study of the epidemic and of the measures to ward it off? Where are these stations to be erected? how are they to be organized? who is to name the members? who is to give them their instructions? Is there to be a permanent or only a temporary International Central Committee? What are its powers to be, and what its organization? Is it to have the power to decide about all international quarantine affairs? If so, where is it to have its headquarters? who is to name it? &c. Under the last head comes the question whether the quarantine precautions are to be taken only against the cholera or against other epidemics likewise.*

With reference to the first series of questions the Commissioners were almost entirely of the same opinion as the delegates assembled at Constantinople in 1866 had been. They affirmed that cholera spreads from India; that it is not likely to become localized in Europe or America; that it travels with man, and only to a limited extent through means of the atmosphere; and that it may be spread through means of drinking water, soiled linen, or merchandize, coming from an infected locality. By far the majority of the members of this conference were

* *The Times*, 8th July 1874.

of opinion that the period of the incubation of the disease did not last beyond a few days ; and that as a general rule disinfectants, though useful in conjunction with other measures, were not to be relied upon to prevent the spread of cholera among the inhabitants of an infected locality.

With reference to quarantine the following rules were passed :—

“ 1. All ships coming from infected or suspected ports, as well as those from uninfected ports, which during the voyage have touched at an infected place or held any communication with an infected ship, or on which during the voyage suspected cases of illness or death from cholera have occurred, to be subjected as soon as possible after their arrival to a strict medical examination as to the state of the health of their crew and passengers, the captain, ship's officers, and doctor (when there is one) being bound to report to the examining doctors any suspicious symptoms of illness on board which may have come to their knowledge. If the medical investigation shows that no case of illness in any way suspicious exists among the crew and passengers, the ship with all that it carries to be immediately admitted to free pratique.

“ 2. The bodies of those who have died of cholera as well as all cholera patients found on a ship newly arrived to be taken on shore, the former immediately buried, the latter placed in a hospital always kept in readiness for such cases, or when that is not possible, in some house or barrack or isolated place. Should any suspected cases of

cholera or deaths have occurred during the voyage, or should suspected or decided cases of cholera, or dead bodies whose death is traceable with probability or certainty to cholera, be found on board a ship on its arrival in port, the crew and passengers, after the removal of the sick and dead, to undergo a process of cleansing and disinfection, under the supervision of the board.

“3. At the same time all the clothes worn by the healthy individuals, or used by them during the voyage, as well as all their effects, to undergo a thorough disinfection in a room arranged for the purpose, under the superintendence of the board. After the disinfection their effects will be given back to their possessors, who in the meantime will have taken a cleansing bath, and they will then be perfectly free.

“4. After the withdrawal of all persons not absolutely necessary for the service of the ship, any vessel arriving under the above-named conditions to be subjected in all its compartments to a thorough disinfection.

“5. The goods landed from the disinfected ship, even when the cargo is rags, and the objects used by the cholera patients, after being properly disinfected, to be considered innocuous.”

A commission was appointed to discuss international regulations for the quarantine establishments in those states which intended to erect such. After the delegates of Holland and Italy, on principle, had declined to be chosen, A. Hirsch (Berlin), D'Albert Glaustätten (Austria), Seaton (England), Fauvel (France), and Bartoletti (Turkey) were appointed. The report, which, without

any important alterations, was accepted by the conference, states that quarantine against the spread of cholera is applicable on sea to ships coming from infected ports. The following rules are then laid down :—

“ 1. Vessels from infected ports must undergo an observation quarantine, which, according to circumstances, may last one to seven full days. In the Oriental ports of Europe and elsewhere, though only in certain exceptional cases, the surveillance may be prolonged to ten days.

“ 2. When the board of health have sufficient proof that during the passage no case of cholera, or anything like it, has occurred on board, the surveillance is to last three to seven days, reckoned from the medical inspection. If, under these circumstances, the voyage has lasted at least seven days, the surveillance is to be limited to twenty-four hours, to give time for the examination and disinfection considered as necessary. In cases under this category the observation quarantine may be held on board as long as no case of cholera or suspicious circumstance occurs, and when the hygienic conditions of the ship allow of it. In these cases the unloading of the ship for disinfection is not necessary.

“ 3. When, during the passage or after the ship's arrival, cases of real or suspected cholera occur, the surveillance for those who are not ill is to last seven full days, beginning from their isolation, in a hospital or whatever place is assigned to them. The sick will be disembarked and properly attended to in a place separated from the persons under surveillance. The ship and

all objects to undergo a thorough disinfection, after which those persons obliged to remain on board will be subjected to surveillance for seven days.

“4. Vessels from suspected ports, that is, such as lie near a port where cholera prevails, and are in intercourse with it, may be subjected to observation quarantine, which must not last more than five days if no suspicious circumstance happens on board.

“5. The emigrant and pilgrim ships, and in general all vessels whose character is deemed especially dangerous to the public health, may, under the above-named conditions, be made the objects of particular regulations, which the board of health will decide.

“6. When the conditions of a place do not allow of the prescribed regulations being carried out, the infected ship is to be despatched to the nearest hospital, after it has received all the assistance that its condition may require.

“7. A ship coming from an infected port, which has touched at a port *en route*, and there being allowed free pratique without any quarantine, will still be regarded and treated as coming from an infected harbour.

“8. In cases of mere suspicion the disinfection regulations are not prescribed, but they may be applied when the board of health consider them necessary.

“9. In ports where cholera is epidemic especial quarantine is no longer to be kept, but only means of disinfection to be employed.”

With the resolution to abolish river quarantine the stipulation was made that river boats, when cholera

patients are found on them, should undergo a thorough inspection. At the same time the intercourse between both banks to be kept open. When the debouchures of rivers are navigable for sea vessels, these are to be subjected to the rules for sea quarantine.

The Conference showed greater unanimity in the third series of questions respecting the establishment of an International Sanitary Commission. It advanced seventeen articles as *desiderata*, the most important of which are—

“An International Epidemic Commission to be organized.

“To be permanent, and have its seat at Vienna.

“Its members to consist of delegates from all the governments taking part in it.

“A president to be chosen from among them as representative of the Commission, who will correspond directly with the different governments, and eventually with the various sanitary boards.

“The International Commission to be independent in its scientific labours, but administrative questions to be decided by a majority, every state having a vote in all final decisions.’ The ordinary routine of business to be settled by the board itself.

“The Commission to be bound to communicate to their respective governments the results of their scientific and administrative labours.

“The necessary computations of cost to be made by the board and submitted to their respective governments. The expenses to be covered by the contributions of the

different states, and eventually by receipts. The sum total required to be apportioned among the different states with reference to the numbers of their population and the tonnage of their commercial fleet.

“The objects of the International Epidemic Commission to be the furtherance of the study of epidemics among mankind, proposals for the erection and administration of quarantine establishments, professional opinions in answer to inquiries from any governments represented in the Commission, the arranging of international sanitary conferences as often as necessity requires, and the drawing up of their programmes.

“Where epidemics are constant, permanent stations to be established; and where they exist only for the time being, temporary arrangements to be made for the study of the epidemic on the spot, and inquiry into means of protection from it. In the same manner, during any great epidemic, arrangements to be made to follow it from place to place, with the object of studying the laws of its dissemination.

“For those territories which have no organized sanitary service, such epidemic stations to be established, with the consent of the governments to which they belong, on the principle proposed by the International Commission of assisting such countries in times of severe epidemics.

“The international epidemic stations to be subject to the Commission. Their *personnel* will be appointed by them with the consent of those states on whose territory their labours are carried on.”

Before bringing the history of cholera to a close, I must advert to a few facts regarding its occurrence in the Andaman islands. These islands, or rather the places we occupy on them, are situated in north latitude $11^{\circ} 42''$, and east longitude 93° , and therefore, by steamer, about three days' voyage from Calcutta or Madras, and some 300 miles from the coast of the Tenasserim provinces. In 1858 the Government of India determined to plant a penal settlement on the islands, and it has since received upwards of 15,000 convicts from the shores of British India.

Dr. Rean, the Superintending Medical Officer of Port Blair, assures me that he has never seen a case of genuine cholera among the convicts, except when it has been introduced into the island by prisoners arriving from Calcutta. I shall give instances in detail; but the fact I would particularly notice is, that although the convicts sent to the Andamans are natives of India, and the islands situated in the Bay of Bengal, cholera has never occurred there spontaneously, in spite of the circumstances by which these convicts are surrounded being almost precisely similar to those of their fellows in other parts of India. It is true, cases have from time to time been entered as cholera in the returns, but Dr. Rean, a man of wonderful energy and great ability, who was himself nearly killed by cholera when serving with the gallant Meer's Regiment, at Cawnpore in 1857, distinctly states that, with one exception, his belief is that no genuine cholera has occurred among the convicts in the

Andamans unless the disease has been introduced into the place from without.

Dr. Rean took me to the house in which this one suspicious instance had happened, and although, unfortunately, the medical officer in charge of the case could give us little useful information on the subject, still it appeared to Dr. Rean and myself, from the statements which the patient's attendant made, that the man did not suffer from suppression of urine; and it was further evident that he was an extremely sickly individual who had constantly had attacks of hemorrhagic dysentery. It is true, deaths have been reported among the convicts from cholera simplex, the disease being precisely analogous to our English summer cholera, but clearly the genuine Asiatic form of the disease has been unknown among the inhabitants of the Andaman islands up to the present time, with the exception of the following instances, when it was imported from foreign sources.

The first case occurred in 1864, in the instance of some prisoners brought to the Andamans in the steamer "Arracan." This history like so many of our records on the subject is contained in various reports, and until these were brought together it lost more than half its value.

In Dr. Plank's annual report for 1864 on the jails of British Burmah, he writes: "On the 19th of November last, I observed within the jail inclosure at Rangoon a party of 250 transport prisoners, who had come down from Calcutta in the steamer 'Arracan' on their way to the Andamans, and had been landed by order of the

Chief Commissioner for a day or two. I had them drawn up in lines, and carefully inspected them.

"I found most of them looking below par, perhaps in great measure the result of sea-sickness. They were nearly all small men from Bengal Proper, and many faces with bad expressions were observed amongst them. I found that of this number, 250, ten were sick in the jail hospital, and that eleven more had been left on board ship, who had been thought too weak to bear removal on shore. I observed that all the prisoners had irons on their legs, and iron handcuffs on their wrists. They clamoured to be allowed to wash, and some had lice in their heads; many had long hair, bushy beards, and long moustaches. There was no attempt at uniformity of dress amongst them. Some had the warm caps of the north-west, and said they came from Allahabad, and some had little cotton caps, one a particoloured cap of a native sepoy regiment; most had scraps of turbans.

"I observed that their bedding, clothing, and eating vessels were good and sufficient. One man showed me some common uncooked grain, moist with water in a tin-pot; he complained that this disagreed with him. I asked to see a specimen of the dry article, and he produced dry grain from the corner of his sheet where it was tied in a little bundle. The Havildar of the guard said this was given to the prisoners a handful at a time when they asked for it, that it did not form an item of their regular diet, which consisted of a preparation of rice, called 'Choorā,' made by boiling rice with water, then crushing it, and afterwards drying it in small flaky pieces. Some was given to me and appeared to be good food. A sufficient quantity of 'Choorā,' with an ounce of sugar, formed the daily ration of each prisoner. There seemed to be little discipline amongst these men, who were bad looking and noisy.

"In the afternoon of the same day I visited the steamer 'Arracan,' in which these prisoners had arrived. I found its 'between decks' clean, and well arranged to secure the prisoners, the decks being partitioned off on each side through its whole length by a wooden palisade, enclosing the machinery also on all sides. These two long cages had doors at each end, and perhaps were large enough to accommodate 150 men, but I had no opportunity of measuring them.

I found eleven prisoners on board, who had been thought too weak and ill to bear removal to the shore; they were all lying exposed to the sun on the upper decks; one man who was dying of choleraic diarrhoea had been placed with his body slanting conveniently towards a scupper hole. One prisoner was found with extensive gangrene of a great part of his left thigh, his gangrenous limb partly covered by a piece of calico, scarcely long enough to cover all the dying skin.

"In the evening these men were removed in covered carts to the jail hospital, the one with gangrene being admitted to a separate ward in the charitable dispensary of Rangoon, where he afterwards died, his case being hopeless from the first; but common humanity requiring that, to his end, he should be nursed and kept clean.

"On the 22nd a fatal case of cholera occurred among the prisoners who had been landed, and I began to fear that an epidemic of that fatal disease would appear in the jail; but to my great relief, after the lapse of a day or two, the steamer having taken the living freight on board continued her voyage. I have since heard that six, if not seven, of these prisoners died of cholera before they reached the Andamans." *

I have fortunately been able to follow up the history of this vessel after her arrival at Port Blair, Dr. Rean having kindly placed the following details from the MS. records in his office at my disposal.

A somewhat severe outbreak of cholera occurred amongst a batch of convicts, consisting of 273 males and 21 females, who arrived here on the 26th of November 1864 in the steamer "Arracan" from Calcutta via Rangoon and Moulmein, and who landed at Ross Island (the Andamans) on the evening of that day. One of the prisoners who had been ill on board expired almost immediately on being landed, and five others succumbed to the disease during the same night. It continued to prevail until the 8th of December when it ceased, its progress apparently having been arrested by the measures taken to prevent its extension.

* I am almost ashamed to allow this account of the unfortunate prisoners on board the "Arracan" to go forth to the world, but it has been published since 1869 in my former work on cholera, and no notice taken of it; and thus the responsibility of the facts rests with the Government.

Although fifty-one convicts were attacked by the disease (of whom four were females, and of this number twenty-three died, all males, and the remaining twenty-eight recovered, including the four female convicts), it was particularly remarked by the superintendent and myself, on our inspection of the convicts the evening they were brought on shore, that the *whole batch* more or less exhibited a dejected and harassed appearance. As soon as it was discovered that these convicts had brought cholera with them, they were located in two of the detached airy barracks recently constructed on the island (Ross), and a ration of rum served out daily to each so long as the disease continued—precautions which were evidently attended with the best results.

This outbreak of cholera was characterized by early and rapid prostration of vital power, many of the sufferers having been brought to hospital in a sinking state, very shortly after passing a few loose motions. The treatment I adopted varied according to circumstances; but I think it right to record that I found Condry's fluid (manganate of potass), in one-drachm doses, administered every hour or two, in conjunction with stimulants, to be productive of the greatest benefit in several instances. In the stage of collapse I have found no remedy to be so powerful to arouse the system as the frequent affusion of cold water over the head and face; several cases, indeed, which appeared quite hopeless, having rallied, and eventually recovered when this was adopted.

None of the hospital attendants took the disease, although several of them were necessarily employed in rubbing the cholera-sick with stimulating liniments; and I may here state that considerable personal experience in epidemic cholera has led me to the conclusion that it is *not contagious, but that the exhalations given off by the evacuations are decidedly infectious when allowed to remain exposed until decomposition takes place*. I therefore make a point of having the evacuations received in vessels, charred, and immediately removed from the ward, the contents being emptied into pits in the earth previously dug for the purpose between two and three feet deep, at some distance from the hospital, and then covered over with a layer of charcoal. These pits I do not allow to remain open longer than four hours, and should the hospital floor become the least soiled with the evacuations, I have the spot forthwith sprinkled with the chloride of lime, afterwards well washed, and chloride of lime again sprinkled

over it, with the understanding that it is to remain for three or several hours.

These measures absolutely and entirely prevented the spread of the disease among the other convicts, some eight thousand of whom were located on the spot.

In the following year cholera was again imported into the island, and the Governor of the settlement reports that "on the experience of November 1864, when cholera broke out on the arrival of convicts from Calcutta, measures have been taken that happily have prevented under similar circumstances the reappearance of that disease in this settlement. Though cholera was again brought to these shores among the sepoy guards over convicts on board the steamer 'Golden Fleece,' which vessel arrived in the settlement on the 14th Nov. 1865, yet fortunately the cholera did not extend among the convicts, though some of them were taken with illness that might have rapidly changed into that disease, had not immediate measures been taken on arrival."

Dr. D. B. Smith was in charge of this steamer, and, as he assures me, had great difficulty in getting his men landed at all. Dr. Morton at first refused to receive them; but his objections being over-ruled by the Governor, he had them all washed in the sea, and their clothes destroyed before landing, and the men entirely separated for some time from the rest of the population. With all these precautions, however, some days after landing several bad cases of diarrhœa occurred among the party, but they and their excrements

were handled upon the principles already laid down, and the disease was stayed, as described in the Governor's report.

I do not propose in the present volume working out the history of cholera in India beyond the year 1869, but I may mention one or two instances of the disease, the first occurring in Calcutta on the 25th December 1871, at which time I published the following details in the *Indian Medical Gazette* for March 1872.

Nos. 3, 4, and 5 Russell Street form as fine a block of three-storied houses as any in Calcutta; they stand well apart from one another, and are in fact nearer to a parallel row of houses overlooking the Chowringhee maidan than they are to one another. The locality is admirably drained and supplied with water from the Calcutta municipal works. The three houses above referred to form a boarding establishment, presided over by a lady living in No. 5 Russell Street, and all the European lodgers on the premises are provided not only with food and milk, but also with water from a kitchen in No. 5; for it is remarkable that although the pipes from the municipal waterworks run along the side of the street, the water is not laid on to either of the three houses in which the cholera occurred, but the supply of drinking water is brought in bheesties, dirty leathern bags, and emptied into an open filter kept in No. 5 Russell Street, from which filter the drinking water for all the persons in this boarding establishment is drawn.

There has not been a single case of Asiatic cholera among the Europeans residing in the immediate neighbourhood of Russell Street within the past four years.

On the night of the 26th December a gentleman who had lately been living at Bhowanipore among a community free of cholera, although the disease existed in the neighbourhood, was seized with cholera in No. 4 Russell Street; he passed rapidly into collapse and died the following morning. The wife of this gentleman, and a Christian servant in their employ, who partook of the

food and water* consumed by his master, were attacked with cholera on the 27th: they both recovered. At the same time a lady residing in No. 5 Russell Street was seized with cholera, and during the night of the 27th another lady residing in No. 3 Russell Street was attacked by the disease. Archdeacon Pratt was living in rooms in No. 5 Russell Street; he left the house on the night of the 25th and travelled away some 300 miles by rail to Ghazee-pore. He was there seized with cholera on the 27th, and died from the effects of the disease on the following day.

It appears therefore that of inmates of Nos. 3, 4, and 5 Russell Street who were all in good health on the 25th of December, six were attacked by cholera within the next 48 hours. Since that time there has not been a single case of the disease in the neighbourhood. We cannot overlook the fact, that of the multitude of native servants on the premises, one only ate and drank the food and water consumed by Europeans, and he was attacked with symptoms of cholera. Further, the three houses in which the cholera occurred were respectively nearer to the houses overlooking the Chowringhee maidan (where no cholera occurred), than they were to one another.

We must bear in mind the fact that the one thing which the European inhabitants of Nos. 3, 4, and 5 Chowringhee, had in common, was the kitchen, from which they all received their food and water; and it is very important to observe that the bheestie who carried the water (it may have been from a municipal stand-pipe) in his *mussuck* to the common filter in No. 5 Russell Street, resided in a suburb of Calcutta called Bhowanipore: further, the milkman who supplied milk to the establishment (Nos. 3, 4, and 5 Russell Street) also lived in Bhowanipore, and we have since ascertained that within a stone's throw of the tank from which the milkman gets his water, there is a large house in which no less than eight persons were attacked with cholera between the 18th and 23rd of December, and of these four died. Cholera was in fact very deadly in parts of Bhowanipore during the week previous to the 25th December; and it is quite possible the organic infecting matter in a dangerous state of decomposition was introduced either through the

* It was proved by subsequent analysis that this was hydrant water, but containing just double the amount of organic matter existing in water drawn from stand-pipes close by.

medium of the milk or water, and distributed to the people residing in Nos. 3, 4, and 5 Russell Street, on the 24th and 25th of December, and it affected those susceptible to its influence within three days of the time it was taken into the system.

In conclusion we would urge the necessity that exists for investigating the circumstances of all cases of cholera, both among Europeans and natives in this city; work of this kind is admirably carried out in Bombay under Dr. Hewlett's supervision, and there is no reason why the public should not be kept as fully informed of all that can be learned concerning cholera.

In 1871 there was very little cholera in the Punjab, or anywhere in India. In October and November, however, Lucknow suffered; and on the 28th November there was a sudden outburst at Delhi. On the 20th November a man named Doolla died of cholera, as was subsequently ascertained. There had been two or three other cases in the neighbourhood. The discharges had flowed on the earthen floor of the room in which he died; this floor had been cleaned, it was said, and washed with cow dung and water. On the 26th of November a burial feast was given in this room by his brother. The food—rice, lentil, ghee (clarified butter); sugar and spices, all of good quality, was cooked in this room on the previous day and night, and the moist and hot rice was spread on an open mat laid on the earthen floor. The dead man belonged to the "Reghar" caste, who are tanners, and almost all the males of the caste (about 350, but the exact number is not known) attended the feast. Some of the guests carried home portions of the feast to their wives and daughters, who did not attend. Besides the Reghars, only a few outsiders attended. The feast took place at mid-day on the 26th November, and a few hours afterwards there was an outbreak of cholera among those who had attended. The period of the first cases were not certain, but up to 6 P.M. on the 29th November, 47 cases had occurred, and 15 persons had died; and altogether to the 4th December there were 73 cases and 46 deaths. The attacks and deaths were not confined to the men and boys, but were almost as severe among their wives, though not so bad among the daughters. Taking the whole Reghar caste, male and female, some of whom (female) may possibly not have eaten any of the food, the proportion of attacks to population was 10·8 per cent.

The disease did not spread in Delhi but died out.

Now this localized outbreak could not be explained :—

1. *By reference to locality*, because mixed up in the district with the houses of the Reghars are those of another caste, the shoemakers or Chámar. No Chámar attended the feast, and no Chámar was attacked. There are men belonging to neither caste living in the district ; a few of these were invited to the feast, and these suffered like the Reghars, but those not invited escaped.

2. *Nor can the outbreak be explained by reference to water*, for Dr. Fairweather looked into this point and satisfied himself the water was not to blame.

3. *Nor by reference to effluvia from the earthen floor of the room*, for the women and girls suffered who were not in the room.

4. *Nor by the supposition that it was some air-borne miasm heralding in an epidemic outburst*, for the other inhabitants of the locality did not suffer, and there was no subsequent outburst in Delhi.

Can any experiment be more complete to prove that it was the food which caused the outbreak ? If so, as the food was proved to have been of good quality before cooking, it must have got some noxious property during the cooking. Now the masses of hot rice were heaped on the earthen floor which had been covered with cholera discharges ; the particles of cholera dejections may have undergone some change in the ground or not, but that in some way the cholera poison must have attached itself to the particles of the hot and soft swollen rice must, I think, appear to everybody as the only reasonable explanation. Let anybody look upon it as a matter of evidence without any preconceived notions, and reflect on the cogency of the evidence in all points, and I think little doubt can remain. If we do not admit this explanation, then it is one of those mysterious outbreaks we cannot account for ; but why should we be so fond of making mysteries where none really exist ? *

On the morning of the 21st of May 1871 no cholera was known to exist near Secunderabad (Madras), but on

* "Report on Hygiene for the year 1872," by Dr. E. A. Parkes, M.D., F.R.S., Professor of Hygiene in the Army Medical School, Netley ; *Army Medical Department Report for 1871*, p. 189.

subsequent inquiry it was found that the disease was present in some of the villages on the road to the eastern coast. During the second week of May cholera was very fatal in the village of Sovriapett, within eighty miles of Hyderabad, on the main road. On the 23rd of May three travellers reached Hyderabad on the main road, and died of cholera in the most crowded part of Secunderabad. Cholera broke out in a village (Chikulgoodum) in close proximity to the barracks, hospital, and horse lines of the 10th Hussars, then quartered at Secunderabad on the 23rd of May. On the following day, the Queen's birthday, the Hussars paraded in fairly good health; there was only one old case of diarrhoea in the hospital, and none of dysentery. After parade the day was a holiday, but it was not ascertained if any of the Hussars had gone to Chikulgoodum. There was no alteration of food on that day, no extra issue of liquor from the canteen, and no drunkenness. At 10 P.M. on the night of the 24th, a patient in hospital with fever was attacked with choleraic purging; a few hours subsequently two men were brought in from different barrack-rooms, and then one from the married people's quarters. In twenty-six hours from the first case thirty-four men and one child were attacked, and in the next twenty-four hours eighteen more cases occurred; cases occurred for three days more, but in lessened numbers, and on the 5th day the outbreak was over. In all 85 persons were attacked, out of a strength of 385 men, 56 women, and 108 children. All the barrack blocks but one furnished cases.

All the Infantry and Artillery in Secunderabad had not a single

case ; the officers of the Hussars also escaped. In the native bazaar the disease, which had commenced on the 23rd May, continued till the 23rd July, but was not severe as there were only 252 cases and 117 deaths in two months, out of a population of between 40,000 and 50,000.

Now in this localized outbreak the disease was brought by travellers close to the Hussars' barracks on the 23rd May ; on the 25th the Hussars got cholera, while the troops in the more distant barracks entirely escaped. We cannot for a moment doubt that the travellers brought the disease to the Hussars, but by what channel of entrance did the poison get into the barracks ?

It is quite clear that in such a case as this Pettenkofer's views break down entirely and irretrievably. He asks for a case where the ground could have no influence ; here is a decided case, because it is not only impossible to suppose that the ground under the barracks (which were perfectly clean, and with drains in good order) got contaminated with the supposed factor x , but there is a crucial piece of evidence against the ground. The Hussars marched out from the barracks and a guard of sepoys was put in, and 400 native labourers were employed to clean the infected rooms. A company of native sappers opened the drains, and bricklayers were at work. Not a man of these got cholera, or had the slightest indisposition ; but if the ground had been impregnated it is impossible they should have thus escaped.

The ground theory, in any shape, as in the case at Delhi, breaks down hopelessly.

What was then the cause ; was it in the air, the food, or the water ? It appears that the direction of the wind was north-west up to the 25th May ; the village of Chikulgoodum is south-east of the barracks, so that the wind was blowing on the 24th and 25th from the barracks towards that village. It could not have been air-blown, therefore, neither was it in the food, as all the regiments had the same issues.

The question of water-supply has given rise to great differences of opinion. Dr. Branfort Scott, who was in charge of the regiment, altogether denies its influence ; but Dr. Cornish has adduced reasons all but conclusive to show that the Hussars obtained some of their water from a public well, which was liable to be fouled by impurities. But there is no certainty where all the water was ob-

tained, as it was brought by the native water-carriers from any place they chose, and it so happened that there were two wells, one in the horse lines, another near the horsekeepers' lines, both of which are "within an easy distance" of the Chikulgoodum village, where the cholera-stricken carters halted on the 23rd May. Whether this was so or not is incapable of proof, but it is curious that a suspicion existed at the time of the outbreak that the water had been brought from an impure source.

At any rate the evidence shows that introduction by water, &c., was far the most likely cause of this most remarkable localized outbreak, and as the introduction by ground effluvia, and air and food poisoning was disproved, the argument from exclusion is of no mean weight. *

We have had to refer over and over again in the pages of this work to outbreaks of cholera (A.) among the unfortunate prisoners of our Indian jails, and it is with great pleasure therefore that I find Dr. H. Blanc (formerly one of the Abyssinian prisoners) aiding Dr. De Renzie of the Punjab to lead to a satisfactory solution of the question as to how the disease may be averted from our convict population in Hindostan. Dr. Blanc reports in *The Lancet*, August 21, 1875,

The Yerrowda Central Jail is situated in the Deccan, some 1,865 feet above the level of the sea, and distant some four miles N.N.W. of the town and camp of Poona. The slightly undulated plateau on which the jail is built consists mainly of trap rock. The country around is bare, a few mimosæ and euphorbiacæ alone cast their scanty shade over the bleak and exposed locality. It is naturally well drained, the nearest village is a mile distant, and from the central tower of the jail the Moola River can be seen winding

* "Report on Hygiene for the Year 1872," by Dr. E. A. Parkes, Professor of Hygiene in the Army Medical School, Netley; *Army Medical Department Report for the Year 1871*, p. 191.

right and left about a mile on each side, and marking with its blue line the limits of the peninsula on which the jail has been erected.

Some large wells and tanks (former quarries) exist in the vicinity of the jail, but they are used only for agricultural and building purposes. Quite recently water was brought to the jail by iron pipes from a lake near Poona; before that the drinking water for the prisoners was obtained from the Moola River before its southerly curve—i.e., before it became polluted by the towns of Kirkee and Poona, around which it flows.

The heat during our last hot season was excessive and unusual, at the same time the diurnal range was considerable. During the month of May, in the shade, the maximum varied between 100° and 106° Fahr., and in the sun from 115° to 126° . The nights and mornings were relatively cool, the minimum in the shade being 72° to 75° . The weather was remarkably dry, the rainfall during March, April, and May being 1 inch and 72 cents., and the number of days on which rain fell during three months only three.

The season did not, however, prove unhealthy, and the admissions into hospital fell below the average. Cases of febricula due to exposure to the sun, and slight surgical cases, formed the large majority of admissions, and diarrhoea did not prevail above the average of former years at that season.

At 2 A.M. on the morning of the 27th of May, a case of cholera, the patient being in a state of collapse, was taken to the jail hospital, and by noon on the following day twenty cases had been admitted. These cases came from both circles then occupied, and from nine different barracks; and to all appearance this sudden outbreak was general, but a searching inquiry soon made it evident that the epidemic was as yet limited to a certain number of prisoners, who had lately been employed in making a new road from the jail towards the Moola River, there to join the Poona road; and the first impression of a general outbreak was due to these men being quartered in different circles, and distributed among the several barracks.

I do not intend mentioning here the steps taken to arrest the progress of the disease, as I wish to limit myself to the cause of this outbreak. It will be sufficient to state that they were vigorous, and carefully carried out, and attended with such success that only two

cases occurred from among prisoners who did not belong to the gang of men mentioned above.

The following table will show the principal features of the outbreak of cholera we are considering :—

Date.	Number of Cases.	Number of Deaths.	Number of Recoveries.	How Employed.	
				Road Gang.	Otherwise Employed.
May 27th, . .	7	5	2	7	—
„ 28th, . .	13	2	11	13	—
„ 29th, . .	2	1	1	1	1
„ 30th, . .	1	—	1	1	—
June 1st, . .	1	—	1	—	1
Total, . .	24	8	16	22	2

A few words on the two cases that occurred inside the jail before examining the interesting and important question of the appearance of cholera among the road gang,

The first case of cholera that occurred among prisoners “otherwise employed” was on the 29th of May. This man was sleeping, on the night of the 26th-27th, near one of the cases that occurred on that night. The suddenness of the outbreak took everyone by surprise, and much time was required before the cholera cases could be removed. It is not improbable that this man may have been infected by the choleraic discharges, as the patient not only vomited in his vicinity, but passed before him each time he had to resort to the night privy. The second of these cases occurred in a prisoner who had been attending on cholera patients. Contrary to orders, this man took his meals inside the cholera ward, and drank of water that had been standing there. In his case direct infection cannot be doubted.

These two secondary cases disposed of, I will now describe the

conditions under which cholera made its appearance among the prisoners who had been working on a certain road during the previous days.

The subjoined tables show the occupation of the prisoners on the days preceding the outbreak:—

A.—Prisoners engaged in Intramural Labour.

Date.	Excused from Labour.	Jail Servants.	Factory.	Miscellaneous.	Total.
May 24th, . .	59	172	301	16	548
„ 25th, . .	53	172	304	12	541
„ 26th, . .	57	174	310	13	554

B.—Prisoners engaged in Extramural Labour or in Out-door Labour in Jail Inclosure.

Date.	Jail Servants.	Public Works Department.	Jail Repairs.	Garden.	Thatching Roofs.	Road Gang.	Total.
May 24th, . .	161	370	10	42	87	61	731
„ 25th, . .	161	373	10	42	18	134	738
„ 26th, . .	163	376	10	42	18	116	725

These 1,279 prisoners, as a body of men, can in many respects be considered as a unit. They have the same diet, the same clothing, dwell in the same locality, are exposed to the same meteorological influences, &c.; they differ, and that slightly, but in one respect, according to the labour in which they are engaged.

From the tables given above it will be perceived that of the total number of prisoners about 554 worked under cover. But cholera broke out among those who had been working in the sun, and as

this cause might be deemed to have had some influence on the development of the disease, this group of 554 men will be eliminated, and the inquiry limited to the second group of 724 men, who were all of them equally exposed.

Some of the men belonging to our second group were engaged on masonry; some in dragging heavy water-carts along a bad road, and supplying the jail with water; others were engaged in ploughing or in garden work, or conveyed the night-soil outside the jail, &c.; and some in watering and rolling a new road. None of these occupations are one more than the other "cholera-producing," and when we find that among this group of men only a certain number contract the disease, we must seek for an explanation beyond telluric influences, cholera waves, absence of ozone, &c.

Now, if the men among whom cholera appeared were on no single point differently placed from the other, with but one remarkable exception, this fact must necessarily carry great weight with us, and assist us in solving the arduous question of the etiology of cholera. All the prisoners, whether engaged in intra or extra-mural labour, were supplied with water taken from the Moola River before it reaches Poona; "the only exception occurred among the prisoners engaged in road work, who drank water taken from the bed of the Moola River below the dam."

It will be observed by a reference to the table of employment that the road gang was considerably increased on the 25th and 26th May. The road had already been metalled, and the extra hands were required to water and roll the road, so that it might not be damaged by the daily expected heavy rains. It should be here stated that a certain number of barrels for storing water, and water-carts, were sent with the road gang, and that water for drinking purposes was brought to them from above the dam. Five water-carts had been also sent with these men for the purpose of watering the road whilst it was being rolled by others; these carts were filled from the nearest water obtainable—that is, from pools in the nearly dry bed of the river, opposite to the Poona end of the road under construction. The prisoners admitted that they had drunk freely of that water, not only when they filled the carts, but also when they were made to wash before returning to the jail after their day's task was over. The cholera patients to whom this query was put all unhesitatingly declared that they had partaken freely of it; moreover, the warder

who was in charge of the carts for supplying them with drinking water corroborated the fact in a remarkable manner. He stated that on the 25th and 26th of May he had conveyed to them less water than on the previous days, although the number of prisoners at work on the road was nearly three times as great. "The fact of the road gang drinking water taken from a source different to the one used by the remainder of the prisoners is placed beyond any doubt."

Was cholera communicated to these prisoners through the water they drank? This is the question I will now endeavour to solve.

On the morning of the 29th May Mr. Taylor (the jailor) and myself visited the locality from which water for watering the road had been taken. The identical spot was shown to us by the warders on duty on the 25th and 26th, and their testimony was corroborated by our finding there several pieces of jail clothing. Some 600 or 700 yards above this spot the river is barred. A dam was erected there some years ago for the purpose of securing a constant water-supply to the city of Poona, the river generally running nearly dry during the hot weather. The bed of the river, from the dam downwards contained but little water; where we were standing, we saw several large semi-stagnant pools, separated from similar small expanses by high boulders and moss-covered islets of volcanic rocks; slowly flowing streamlets connected these pools one with another, but on our side of the river-bed the current was so weak that we almost doubted its existence. Between the locality on which we were standing and the dam a number of washermen were at work; men and women were seen here and there performing their morning ablutions, &c.; cattle were roaming about; and a glance showed that the bed of the river between the dam and the place from which water had been taken for watering the road must be contaminated by excreta of all kinds. The river was not overflowing the dam on that day, and from inquiries we learnt that it had not done so for several days. One of the sluices was open, but on the opposite (Poona) side of the river. Water was taken from the pools above mentioned and forwarded to Dr. Gray, the chemical analyst to Government. *

* Analysis of the water made by Dr. Gray, chemical analyst to Government :—Solid grains per gallon, 10·36; chlorine, '95; hardness, total, 6·30; hardness, permanent, 3·42; oxygen removed by readily oxidizable matter of water, at 140° F., '072. Part per million of free ammonia, 0·32; of albuminoid ammonia, 0·22.

Cholera existed at the time throughout the province, in Poona, and in the neighbouring village. In India the bed of a river in the vicinity of a large city is the usual place selected by travellers before entering the town to perform their ablutions, &c. ; washermen are constantly at work in the same locality; in fact, we could hardly expect to find anywhere so many agencies united to contaminate drinking water by means of choleraic discharges, and irrespective of what the inquiry had already allowed us to surmise, we would have already strong grounds for accepting the outbreak as due to the propagation of cholera through drinking water. In this instance, however, we possess evidence still more direct and positive.

On the 22nd, of May two fatal cases of cholera occurred in the village of Yerrowda, situate opposite the dam, and we learnt that on the evening of the 22nd these bodies were washed and burnt and the clothes worn during their fatal illness washed some twenty yards above the spot from which water had been drunk by most of the road gang, and which proved so poisonous and deadly to many of them.

CHAPTER XII.

GEOGRAPHICAL DISTRIBUTION OF CHOLERA—EFFECT OF METEOROLOGICAL INFLUENCES ON THE DISEASE.

WITH regard to the distribution of the disease, the only countries which have up to the present time remained free from Asiatic cholera are, Australia, New Zealand, and the other islands of the Pacific ; the Cape of Good Hope and its adjoining settlements, the islands of St. Helena and Ascension ; the Azores, Bermuda, Iceland, the Faroe, and also the Orkney and Shetland islands, and lastly the western coast of South America. *

But in India we find that the inhabitants of certain localities have escaped the influence of cholera in a very remarkable manner. For instance Dr. W. J. Moore assures us that the disease was unknown at Mount Aboo until the year 1869, and that it had never visited Otocamund prior to 1861.

I have had occasion to refer several times to the fact of cholera having been imported into Simla, and over the

* Dr. Gavin Milroy "On Cholera," *Med.-Chir. Review*, 1865, p. 434.

Himalayas, at elevations considerably greater than Mount Aboo ; in fact lofty chains of mountains are evidently no effectual bar to the progress of the disease ; in spite of them cholera has on several occasions raged throughout Nepal and Afghanistan ; it has crossed the Caucasus chain at an elevation of 7,000 feet, and has committed terrible devastation among the inhabitants of the table-land of Mexico. And since our Himalaya sanatoria have been increasing in size, it is evident that cholera is becoming more common among the people who resort to them. Hardly a year passes now without deaths from cholera occurring at Simla. Nor can we wonder at this when in 1865 the Sanitary Commissioners inform us that "the sides of the hills are everywhere studded with human excrements, and the smells which arise in every direction are a disgrace, especially to a place which professes to be an asylum for the sick. The water must also be more or less contaminated. In summer the dry beds of the mountain torrents are places of convenience ; it is not difficult to understand how filth lying in their beds, or on the hill sides from which they are fed, should poison the whole water of the station. In one particular locality there is a striking illustration of what must to a certain extent occur all over the district. The edge of a hill at a few yards distance from the public road is lined with filth, and is evidently the resort of the numerous servants in the locality ; and at some distance lower down the slope is the spring from which the water supply of Peterhoof (the summer residence of H.M.'s Viceroy), and many of the large houses in the vicinity, is

drawn. What must occur after every fall of rain is too obvious. *

In 1866, '67, and '68, cholera appeared in Simla in a deadly form; and on the 5th of July 1869 we learn from *The Englishman* that "Dr. May has just finished an elaborate series of analyses of the waters of Simla. He has given it as his opinion that the water is naturally the purest he has found in India; but as it reaches the consumer it is the most impure he has ever analysed. The amount of nitrates in it in an active state of fermentation is something appalling."

We should naturally have supposed that after the condition of Simla from a sanitary point of view had been exposed in this way, that something would have been done to improve it, the more so as the station has since 1865 been occupied some seven months out of each year by the Viceroy and his staff, including the Sanitary Commissioner, with the Government of India; but so far from this being the case, we find that on cholera breaking out at Simla in 1875, ten years after the above report was written, that the sanitary condition of the place was almost as bad as it had ever been; and if Simla, the chosen retreat of the Viceroy and his staff, has been neglected in this way, what are the chances of sanitary improvements being carried out in other places? With reference to cholera at Simla during the year 1875, *The Times* of 25th October 1875 remarks—

The recent outbreak of cholera in this station has roused the Government to action. A commission has been appointed, and is

* *Proceedings of Sanitary Conference for Bengal*, 13th Oct. 1875.

now sitting to inquire into the sanitation of Simla. Every one is agreed that things are about as bad as they well can be, but there is by no means the same unanimity as to the measures that should be adopted. On the face of every hill houses are piled above houses from bottom to top, and thus the drainage of the uppermost houses saturates and poisons the soil around those below them. In the very centre of the station, on the worst possible site that could have been selected for it, is placed a full and crowded native bazaar; and in close proximity to the bazaar are the houses inhabited by the clerks and the lower class of European or Eurasian *employés* in the Government offices.

The Lancet, writing on the same subject (September 1875), observes that—

It is satisfactory to receive information of some improvement, however slight, in the sanitary condition of Simla—a locality on the hills that may be termed the health-resort of India, but which would seem to require an energetic medical officer of health. Thither sick officers and civil servants are sent to regain their bodily vigour; no effort should therefore be spared to enhance the natural salubrity of Simla. According to the Indian correspondent of *The Times*, the cholera epidemic is disappearing, after having caused nearly two hundred deaths, of which number, be it observed, only eight or ten were Europeans. How much remains to be done will be seen when we state that the night soil is buried in trenches a few hundred feet below the most populous part of the station, and when the wind blows up the hill the stench is intolerable. The drinking-water is said to present occasionally the appearance of milk. The correspondent hopes that the warning of this year will be taken to heart, and that we shall hear no more of cholera at Simla.

Only one of our hill sanatoria in the Himalayas has escaped the effects of cholera (A.), and that station is Dalhousie, which is supplied by an aqueduct through which water flows from a spring situated outside the

limits of the station, and so placed out of the way of contamination to a great extent.

From even a cursory study of the history of the disease, we arrive at the conclusion that, at times, cholera breaks out with terrible violence among the inhabitants of the Himalayas and other mountainous countries, and consequently that there is nothing in the geological formation or other circumstances of these regions precluding the generation of the disease among their population. The fact of the inhabitants of these localities being comparatively few, together with other causes which we shall subsequently notice, prevent the disease from taking such a firm and lasting hold upon them as it does upon those dwelling in the plains; but probably among no class of human beings has the death-rate from epidemic cholera been higher, than among the inhabitants of the mountainous countries bordering the north and north-west of Hindostan.

Dr. E. Balfour in 1856 referred to the fact that certain localities in the Madras Presidency enjoyed a remarkable exemption from cholera. Occurring among these places he refers to the inhabitants of the hill tracts of Orissa. These low hills stretch away from Orissa down into Nagpore and Central India, and they send off a spur at right angles, which reaches northward as far as the Ganges at Rajmahal, and are inhabited by the aborigines of the country.

The hill tribes of Bengal have the greatest possible aversion to the people of the plains, and, on the other hand, the latter look on the hill men as little better than

dogs—unclean creatures, without caste, whose presence is to be avoided; their touch is a source of contamination to the orthodox Hindoo; food, water, or anything which hill men have handled, if partaken of, being sufficient to destroy the caste of the person who eats it, thereby inflicting upon him innumerable ills in this world and the next. It is hardly possible for those who have not lived among the people of India to understand the extent and depth of this feeling; it is tantamount, as far as all personal contact or relations are concerned, to the most stringent laws of quarantine between these races. The hill men so long as they remain among their mountains are absolutely isolated from domestic intercourse with the people of the plains. From among the latter cholera is never absent, but the former are rarely visited by the disease when in their own homes. Colonel Dalton of Chota Nagpore, the Rev. W. Storrs, at Paljheri, and many other persons I have spoken to on this subject confirm the information given by Dr. Balfour; cholera certainly does not exist among these hill men in an endemic form, and very rarely appears among them as an epidemic disease, and yet their hills crop up in the midst of the Gangetic Valley, in many places being adjacent to towns and villages from which cholera is hardly ever absent.

We naturally ask if there is anything in the mode of living of these people that accounts for their exemption from cholera. I think not; they are, like most hill tribes, dirty in their persons; their habits are far from clean; they do not object to half rotten or even raw meat, and

frequently live on the fruits and roots of jungle plants ; they are a singularly merry-hearted, jovial race, but their best friends would hardly accuse them of living under favourable hygienic circumstances when at home.

Is it then that these hill people, like canine animals, are insusceptible of the influence of cholera? Certainly not ; for of all men they probably suffer most severely from it when they visit the plains, especially during our cholera months. I have given an instance of this in the case of the Shergotty prisoners in the years 1832-33. It will be remembered that in this outbreak of disease Dr. Marshall expressly states that it was the hill men in the jail who were killed by cholera ; that only one or two of the people belonging to the plains were affected by the disease, though living within the same walls, partaking of similar food, and existing under precisely the same circumstances. We have had illustrations of this fact over and over again of late years among hill men passing through the plains of Bengal, on their way to the tea gardens of Cachar and Assam ; the mortality among them from cholera has at times been fearful, until it was discovered that they were peculiarly sensitive to the disease ; but by taking them over the Gangetic valley during the cold season they reached their destination in Cachar and Assam free from cholera, and when once they had passed this danger were by far the healthiest and best men the tea planters could secure.

If the hill men are so easily attacked by cholera in the plains, and yet remain free from it in the hills, their mode of living being what most people conceive would actually

conduce to the generation of cholera, it seems natural to suppose that the hills must have something to do with their immunity from the disease.

The low metamorphic hills, however, upon which they dwell seldom-rise to a greater altitude than a few hundred feet above the level of the plains, and I have referred to frequent instances of the inhabitants of far more lofty ranges of the same geological character being severely visited by cholera, as, for example, the inhabitants of the European part of the island of Bombay and the surrounding country. I am perfectly ready to grant, as was first pointed out by Dr. Bickes in 1832, that among the inhabitants of mountainous countries through which streams pass with some rapidity, where no stagnant or retarded waters are met with, and where the foundation is rocky and the soil sandy, cholera is less apt to make an impression than among people living on an alluvial soil. But admitting all this, it does not by any means sufficiently account for the exemption of the Bengal hill people from cholera. The population of Nepal and the Himalaya are not spared from the ravages of an invading cholera; it rushes in among them and destroys them at a fearful rate, and yet the hill people of Lower Bengal escape. The essential difference between the two is this, that the latter are, when at home, isolated from the men of the plains, the real source of contamination: while the inhabitants of the Himalaya are guarded by no such protecting influence; being Hindoos, they flock down in masses to perform religious rites at Hurdwar and other holy places; there they meet their brethren

of the plains, and imbibe, it may be the washings of their bodies and clothes contaminated by cholera matter as at Hurdwar in 1867, which they carry back and disseminate all over the Himalayas. The hill men of Bengal perform no pilgrimages; seldom, if ever wash their bodies or clothes at all; are cut off from all social ties with the men of the plains; and they escape the cholera till they come down into the delta of the Ganges, and partake, probably, not so directly of contaminated food as of contaminated water, the consequences being such as I have described. So long as they remain isolated in their houses, like the convicts in the Andamans, neither wind, climate, food, or any other circumstances, can generate cholera (A.) to any extent among them; but bring the hill men into the plains, where cholera prevails, or take the disease to the Andamans where it does not naturally exist, and the result is the same—an immediate outburst of cholera.

After a careful study of the history of the disease, a desert appears to me to be the only country in which cholera is unable to establish itself; the disease speedily dies away in an arid waste of this description.

Dr. Dickson, from careful inquiries into the circumstances of the disease in the north of Africa, came to the conclusion which I have before noticed, that cholera in these regions never spreads beyond three stages into the desert. And in the history I have given of the disease I have frequently referred to the fact of the deserts of Arabia and Syria having been the most effectual barriers to the propagation of cholera by pilgrims crossing them.

In fact as the cholera conference (Constantinople) assert "a great desert is the best of all obstacles to the propagation of cholera." Further than this, we have seen cholera spreading in India with a progressive course from east to west and north-west, brought absolutely to a standstill on the borders of a country which had temporarily been converted into a desert from the suppression of the usual rains ; I allude to the cholera of 1833 and 1860 in the north-western provinces. It is evident that in these instances it was neither the geological formation of the soil, the occupation or mode of living of the people, or in fact any other conceivable cause except the want of moisture in the air and soil of the drought-stricken country which stayed the progress of the destroying power among the population ; for these districts had, on previous occasions, frequently been affected with cholera and no sooner did the copious rains of the following year set in than cholera burst out among the inhabitants of the country which had been a desert the previous season.

My impression therefore is, that so far as the geographical distribution of cholera is affected by desert tracts, we must look to the absence of moisture in air and soil over these regions as being the influence which shields those who travel over them, or dwell in them, from cholera. These remarks do not apply to persons crossing a desert country in a railway train ; but to caravans and such like bodies of people who spend weeks and months in travelling over these sandy plains.

With regard to Australia and the other countries I

have named as being exempt from cholera, I may observe that, as a general rule, they are all at a great distance from India, and have very little communication with her or with other countries while affected with cholera. In fact, from their geographical relations they may be said as regards cholera to be strictly under quarantine, the restrictions being those of nature and not of man's imposition. This is particularly the case with Australia; it is seldom that more than twenty vessels sail from India *via* China for New South Wales during the year; but this state of things has very recently been changed, for a line of steamers now runs from Singapore, Batavia, and so to Queensland. And as we shall presently show, cholera (A.) is endemic in Batavia. The first of this new line of steamers, the "Sunfoo," left Singapore on the 18th of November 1873, carrying a large number of Chinese labourers for Western Australia.

It may appear that the Cape of Good Hope forms an exception to this rule. True, the great high road from India is now turned through Egypt; still formerly every one leaving India had to go home by the Cape, and yet the place remained free from cholera. With regard to this case we must take into consideration the fact that the voyage from India to the Cape was seldom if ever performed under two months, and beyond this the old East Indiamen were probably the most roomy and best managed passenger ships in the world. And what is of even more importance with regard to the spread of the disease, comparatively little merchandize and but few

passengers arrived in these vessels for the Cape, and there was no unloading of cargo or going into dock. The goods, the people, and in fact all belonging to the ship passed on from the Cape as they had arrived there. Supposing cholera, therefore, to be a communicable disease, and to have been introduced into a vessel sailing from India, the chances are that its influence would have been destroyed before reaching the Cape; but even on arriving there, as the vessel was not unloaded, and but few passengers and none of the crew remained, the probabilities of the disease being communicated to the inhabitants of the place were infinitely less than if the Cape had been a port in which cargo and passengers were landed, and the vessel taken into dock and cleaned.

It would seem therefore, as I have before said, that the characteristic features of those countries which are exempt from cholera are, that they are at a great distance from India, separated from her by a wide expanse of ocean and having very slight intercommunication with her. Otherwise there appear to be no peculiarities common to these countries or in which they or their inhabitants differ from places which have been devastated by cholera from time to time. Their geographical position has isolated them from the home of the disease, and it is to this circumstance we must attribute their immunity from its influence.

But these cases teach us a vitally important lesson, which is, that no meteorological changes, filth, want, or any other similar conditions we know of are capable of

generating the disease *de novo*. If otherwise, are we to suppose that these circumstances only act in certain parts of the world, notably in the route of human intercourse between the East and West, since the disease passes only from India into Europe and from thence to the north of Africa and across to America? That the meteorological, epidemical, or other influences which we may choose to imagine as generating cholera should be confined in their operation to these particular sections of the earth's surface, is certainly an obstacle to any such view, and I think that the exemption of the inhabitants of Australia and other countries from cholera is presumptive evidence against the spontaneous generation of the disease.

II. We must pass on to consider in what parts of the world cholera is now endemic; and I would have it understood that I use the word endemic in its ordinary sense, that is, I understand by an endemic disease one that is common to the inhabitants of a particular country, a native disease—because a different meaning appears to have been lately attached to the word. For instance the Secretary of the Madras Sanitary Commission argues, as no deaths from cholera were reported among the inhabitants of Madras for a few weeks in 1867, that this “immunity from the disease clearly disproved the assertion of the endemicity of cholera in Madras, so unhesitatingly put forward by the Cholera Congress at Constantinople.”* According to my ideas of the meaning of the word endemic, an exceptional circumstance of this

* *Proceedings of Madras Sanitary Commission for September 1867*, p. 389.

kind would not invalidate the inference that cholera is endemic in Madras, provided it were known that for the last sixty years a considerable number of the population have annually been killed by the disease. I am not writing as a statistician, and mean when stating that cholera is endemic in a certain locality that it has been known to prevail there year after year for forty, fifty, or it may be sixty years ; but that it by no means follows that the inhabitants of these towns or districts are never free from cholera (A.)

It will probably simplify our subject to determine, in the first place, if cholera exists as an endemic disease beyond the confines of British India. The Cholera Conference at Constantinople have done much towards clearing up this point. After long deliberation they distinctly declare that cholera is not endemic in Arabia or Persia, and I quite agree with them so far as former times are concerned, but since 1851 there have been very few years in which cholera has not broken out in some part of Persia (see pp. 138-238). In fact since the establishment of steam communication between India and Persia has been an accomplished fact, cholera has persistently prevailed in that country.

I mentioned, when referring to the medical returns from our officers in the Straits settlements in 1839-40, that cholera was not then endemic among the people of that part of the world, and I have their authority for asserting that, up to the present time, Asiatic cholera is not endemic in the Straits. With reference to China, cases of cholera simplex arising from the use of unwhole-

some food, occur from time to time among the people, but these cases are not communicable, they do not spread in an epidemic form, are not accompanied with suppression of urine, the evacuations usually contain bile, and, above all they seldom kill people in the fearfully rapid manner that Asiatic cholera does.

Dr. C. Clouth, who has been practising in Houkong for the last five years, assures me he never heard of, or saw, a case of cholera (A.) during that time, and he has had some experience of the disease, having been on service with the Prussian army in 1866, when cholera (A.) broke out with such terrible virulence among the armies engaged in Bohemia. I have made extensive inquiries among professional and non-professional residents in China, and their evidence is to the same effect as that of Dr. C. Clouth, which is further borne out by the returns of our British troops serving in the treaty ports of China, and by missionaries.* In fact I do not believe that Asiatic cholera exists as an epidemic disease in China. But with reference to Java, the evidence in favour of cholera (A.) being endemic is very strong. As far back as the year 1629 we have an account of Asiatic cholera by Bontius as he saw it in Batavia,† and Dr. Wylie, who has been practising for some years in the island, remarks that cholera is never absent from many parts of the country, more especially the towns,

* Dr. J. Peters on *The Epidemic Cholera of 1873 in the United States*, p. 68.

† *An Account of the Diseases of the East Indies*, p. 26. By Bontius. Translated and published in London.

and that it is one of the permanent scourges of the island.* Surgeon G. A. Einthoven, who has been serving in the Netherlands, India, from 1859 to 1874, assures me that the disease is endemic in Java, and that it breaks out from time to time as a terrible epidemic, 60 per cent of deaths occurring among those attacked by this fatal malady.

Including Java, and perhaps Persia and parts of Russia, we are then driven back upon British India as the home of cholera; that it is endemic there is a fact which none who know the country will feel disposed to dispute.

From the returns published by Dr. H. Macpherson it is evident that cholera has for many years past been endemic in Calcutta.

Deaths from Cholera in Madras.

Years.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
1855, - -	305	351	136	30	14	2	6	45	390	358	207	112	1956
1856, - -	167	128	181	132	147	29	12	2	1	3	1	2	805
1857, - -	4	152	161	135	81	126	114	74	117	115	158	160	1378
1858, - -	433	323	126	28	116	92	94	111	128	128	136	249	1965
1859, - -	349	463	130	72	20	10	12	7	6	3	2	8	1082
1860, - -	3	2	2	6	22	87	1218	637	276	160	91	79	2580
1861, - -	35	75	54	150	204	76	183	599	786	346	107	162	2776
1862, - -	425	485	229	102	189	267	126	222	242	501	519	328	3635
1863, - -	473	452	455	154	84	19	5	8	2	46	10	77	1684
1864, - -	133	110	106	45	3	4	4	97	38	15	9	10	574
	2226	2541	1580	854	880	712	1774	1802	1986	1675	1220	1183	18435

* Dobell's *Reports on the Progress of Medicine*, vol. II, pp. 229,

Again, it is presumed that the population of Madras is about half a million. Mr. W. R. Cornish has given us the mortality from cholera in that city for ten years ending 1864.

Lastly, I have referred, in the history of cholera in India from 1853, to Dr. Leith's tables of the mortuary returns for Bombay, extending over a period of eleven years; from these we find, as Dr. Leith observes, that the disease was never absent from the island of Bombay. Clearly, therefore, it is not correct to suppose that cholera is only endemic in the valley of the Ganges: it is more than probable that the disease is endemic in all large towns along the sea-board of British India, including Chittagong and parts of the Pegu division.* I have already referred to its frequent appearance in the ceded districts of Madras, of which Bellary is the capital, and which includes the tableland between the Eastern and Western Ghauts, having an elevation of some 1,600 feet above the level of the sea. Cholera was doubtless endemic in these districts in 1833-34, and remains so up to the present day, breaking out year after year during the annual festival at Humpi. From these districts passing northward we come to those of "Saugur and Nagode, which belong to the Gangetic basin,"† and in which cholera appears to a greater or less extent twice a year. We shall probably not be far wide of the mark if we

* "Report on Cholera at Thazetmzoo," by Dr. E. Balfour, *Madras Quarterly Journal*, October, 1863.

† "Rough Notes," by J. Oldham, F.R.S., *Indian Annals*, p. 276, March 1868.

draw an imaginary line to the north-east through Saugur, Allahabad, and Gorruckpore, to the foot of the Himalayas ; throughout the whole of the plains to the east of this line cholera is endemic, the intensity of the disease increasing as we approach the seaboard of the Bay of Bengal, the cities of Dacca and Calcutta being pre-eminently the stronghold of this terrible malady. Cholera was formerly, as in Persia, less frequently met with as we advance to the north-west and west from the line I have above indicated, but in consequence of the rapidity of communication existing between Bengal and Upper India, it would be hard to determine if Asiatic cholera is not now endemic in several parts of Oude and the north-west, though hardly in the Punjab, Rajpootana, and Sind. But along the valley of the Nerbudda and Tafty rivers, and throughout a very considerable part of the Bombay Presidency, cholera is endemic.

Before leaving this part of my subject I must refer briefly to the geological features of the three localities, regarding the inhabitants of which our statistical returns are the most accurate, and in which there can be no possible doubt as to cholera being endemic. This is rather an important inquiry, because it has been affirmed that the disease can only flourish as an endemic affection on alluvial soils.

With regard to Calcutta and the large cities near the mouths of the Ganges, there can be no question as to the alluvial nature of the soil upon which they are built, consisting, as it does, chiefly of soft incoherent beds of fine sand and silt of enormous extent and thickness.

But, as I have before observed, within this area large plains of laterite crop up, as in the Orissa, Midnapore, and Beerboom districts, where cholera is without doubt endemic, and that in towns built on these laterite formations. As we proceed up the Ganges extensive beds of clay and kunkur begin to crop out from its banks; even as low down as Bhaugulpore this formation is still alluvial, in that it consists of a strongly coherent reddish-yellow clay, abounding in kunkur, and which forms excessively hard beds, often just below the surface soil, and materially alters the geological features of the country and the drainage of the districts. Patna, Dinapore, Benares, and Mirzapore are built on beds of kunkur of this kind, and cholera is certainly endemic in these localities.

We may, however, turn to the island of Bombay as being of a different geological formation from that of Bengal, the European part of the city being built upon trap-rock of igneous formation, greenstone predominating, but some of the rocks resembling varieties of felstone. No doubt strata of aqueous formation do occur among the trappean rocks of Bombay, but these only form small detached parts. Upon this mass of igneous rocks the city of Bombay is built, and from among the inhabitants of this place Dr. Leith informs us that for many years past cholera has never been entirely absent. But we cannot overlook the fact, that a very considerable portion of the *native town* of Bombay is built on an alluvial soil, an arm of the sea having silted up the space between the rocks upon which the European town is located. And

in all probability it is from the native town of Bombay that cholera spreads ; and though the disease is endemic over the island, still it is probably among those inhabiting the alluvial soil that it remains and germinates.

Madras, like Calcutta, is situated on a deep alluvial deposit ; the mount, however, is of igneous formation, like parts of Bombay.

In connection with the subject of the nature of the soil on which the dwellings of people subject to endemic cholera are situated, we cannot overlook the sanitary condition of many of these towns. The following description of the native dwelling-places scattered over Calcutta, for instance, gives us a faithful picture of the condition in which a very large proportion of the native inhabitants of this, as well as other large towns and villages in India reside.

A bustee or native village generally consists of a mass of huts constructed without any plan or arrangement, without roads, without drains, ill-ventilated, and never cleaned. Most of the villages and towns are the abodes of misery, vice, and filth, and the nurseries of sickness and disease. In these bustees abound green and slimy stagnant ponds, full of putrid vegetable and animal matter in a state of decomposition, whose bubbling surfaces exhale, under a tropical sun, noxious gases, poisoning the atmosphere and spreading around disease and death. These ponds supply the natives with water for domestic purposes, and are also the receptacles of their filth. The arteries which feed these tanks are the drains that ramify over the village, and carry out the sewage of the huts into them. Their position is marked by a development of rank vegetation.

The entrances to these villages are many, but not easily discoverable, whilst the paths are so narrow and tortuous that it is difficult for a stranger to find his way through them. The huts are huddled

together in masses, and pushed to the very edge of the ponds, their projecting eaves often meeting together, whilst the intervening spaces, impervious to the rays of the sun, are converted into necessaries, and used by both sexes in common. In these huts often live entire families, the members of a hut all occupying the single apartment of which it is not unfrequently composed, and in which they cook, eat, and sleep together; the wet and spongy floor, with a mat spread on it, serving as a bed for the whole.

The distinction of caste extends to these villages, but it assumes in these places a new form, by the fact that some portions of them, called parrahs, are inhabited by people of one occupation or trade, whose habits of living give a distinctive feature to each parrah, and modify its general appearance. Amongst the Hindoos, the worst and filthiest bustees are those occupied by Gowallahs (or dairymen), Colóos, Chumars, or Moochees. Amongst Mohamedans, the worst and filthiest villages are those occupied by Garrywans and Khallasees. In bustees occupied by dairymen, in addition to the usual filthy tank, the water of which is used by them to dilute the milk sold for public consumption, there are pools of liquid filth covering a large surface; the area of one of them I ascertained by actual measurement to be over 150,000 square feet.

None of these villages possess a single road or thoroughfare properly so called, through which a conservancy cart or even a wheel-barrow can pass in order to remove the filth. This filth is laid at the door of every hut, or thrown into a neighbouring cess-pool. Not a single hut in the villages is properly built. The dwellings are badly constructed, crowded together without regard to ventilation or the means of being kept clean. The principal defects are due, not only to ignorance and utter disregard of all sanitary considerations by the ryots, but also to the apathy and negligence of the proprietors, who care very little about the welfare of their tenants provided that their rents are paid regularly.

In this description we have a faithful picture of the localities cholera delights in. Nor must we overlook the fact that it is the practice of the natives, rich and poor, to defecate upon the soil around their dwellings. Further,

I may observe that I have never seen such a thing as a pump for domestic purposes in use in India; all the drinking water is drawn from large ponds or tanks, sometimes from open wells, being carried from thence to the vessels from which we drink, in leathern bags—the skins of sheep—having a hole in them once occupied by the neck of the animal; these bags can never be properly cleaned out, and they are often in constant use for several years. Now, considering the practice of the natives above referred to, and the constant heavy downpour of rain we experience from time to time in India, it is easy to imagine how frequently the tanks and rivers containing the supply of drinking water must receive the surface drainage of the surrounding localities, and become contaminated with all manner of organic impurities.

But since Professor Pettenkofer's ideas have been brought so frequently and prominently to the notice of the public (p. 219), as to the influence of the subsoil water and air as agents in the production of cholera, it becomes necessary to test his surmises by actual experience in Calcutta; and we have lately had a valuable report on the subject by Drs. Lewis and D. Cunningham, which was published in the *Lancet* of the 4th December 1875. Dr. E. Parkes remarks,

Since Professor Pettenkofer directed attention to the composition of the air in the soil, and proposed the carbonic acid in it as a measure of its impurity, various researches have been made, the general result of which is not on the whole favourable to Pettenkofer's proposal. The permeability of the soil—*i.e.*, the freedom with which atmospheric air enters it, as well as the composition of the soil itself, so affects the amount of carbonic acid in the air in the

interstices, as to render it probable that the carbonic acid cannot be taken as a measure of ground impurity. But this, while it throws a difficulty in the way of forming an opinion as to the amount of impurity in soil-air, does not at all lessen the belief that a knowledge of the composition of soil-air is of great hygienic importance.

The report of Drs. Lewis and Cunningham is the best we have yet seen on this topic. It examines into all the conditions during an entire year,—the amount of carbonic acid in the soil-air in two localities at 3 ft. and 6 ft. in depth in each case, the temperature of the ground at those depths, the temperature of the atmosphere, the velocity of the wind, the rainfall, and the height of the ground-water are given, and a series of graphic representations place the results before the eye of the reader very clearly.

From these observations it appears that the lines of temperature neither directly nor conversely corresponded with those of the carbonic acid. At the same time, one point came out—viz., that the periods of greatest difference in the amounts of carbonic acid in the 3 ft. and 6 ft. strata coincided with the greatest difference in temperature between these strata. Perhaps this was a mere coincidence; at any rate it was the only indication of any relation of carbonic acid to soil temperature. The soil temperature was at its lowest in January, when the weekly mean at 3 ft. reached 68°, and at 6 ft. 72°, and at its highest in July and August, when the temperatures were 83° and 82°.

The atmospheric temperature in no way influenced the carbonic acid in the soil-air. The rainfall had a distinct influence on the carbonic acid, the main periods of elevation of which occurred with the rainfall, and the period of depression occurred with drought. There was also a general coincidence with the water-level. The velocity of the wind did not apparently affect the carbonic acid, except that in April and May, when the movement of the wind was great, the carbonic acid in the 3 ft. stratum of one of the localities which was exposed suddenly sank, while in the other more sheltered locality no such sinking occurred.

Another very interesting point referred to is the relation of the total Calcutta mortality and the prevalence of fevers, dysentery, and cholera to the soil. Nothing obvious was made out, except with regard to cholera. The authors give a graphic plate showing the weekly cholera mortality in Calcutta in connection with the water-

level, rainfall, and temperature of air and soil. They remark that the "only remarkable coincidence appears to lie in the converse relation which water-level, and in a less marked degree rainfall, bear to the prevalence of the disease ;" when the latter is "at a maximum the water-level is at a minimum, and when the water-level is at a maximum the prevalence of cholera is at a minimum." On looking at the table, however, we think this expression is rather too strong. (See also p. 423)

From July to September 13th the water rose in the soil until it was five feet nearer the surface. The deaths from cholera, never very many, fell in August, and at the time of highest water had fallen to 21 in the preceding month. But from September 13th the water fell with great regularity to the end of the year, and yet the cholera deaths remained practically the same. In the four weeks of September there were 24 deaths ; in the four weeks of December, 29. Not until January 17th does a decided rise occur in the cholera deaths, and then the water was $14\frac{3}{4}$ feet from the surface. The deaths remained at nearly the same number until May 2nd, when they reached the maximum of 94. But between January 17th and May 2nd the water sank only five inches, and that was at a depth of fifteen feet from the surface ; while in the previous four months it had sunk four feet—namely, from ten to fourteen feet—without any more marked influence on the cholera deaths, although the drying ground was much nearer the surface. To this it may be said that the influence of the drying soil required time to act, and that we must look at the whole coincidence instead of trying to dissect it. But if this be so how can we account for the last part of the table? The water-level remained from May 2nd always at its lowest point—viz., 15 ft. 2 in.—from the surface until June 27th, and yet during the whole of this time the cholera deaths were rapidly falling from 93 to 18 per week. If then the drying soil required time to act, what stopped its continued action after May 2nd? Why did it not increase the cholera after May 2nd? The temperature of the ground was then rising ; the water-level was as low as it could be, and yet cholera declined. The coincidence, not that it appears to us strong anywhere, fails here completely. At the same time it would be rash to say that the question is at all clear. In Calcutta the rule as to cholera is that it begins to increase in February, and is most fatal in March, April, and May. April appears, from Macpherson's tables,

to be the worst month (19,328 deaths in twenty-six years), and August the best month (3,440 deaths in twenty-six years). Now, in April the water-level is lowest (fifteen feet from surface), and in August is rising to its maximum of ten feet from the surface, which it reaches in the middle of September. Here, then, it may be thought, is a coincidence too striking to be put aside. It may be so; but, as already pointed out, the table before us shows, it seems to us, points which are not to be reconciled with this view.

And by referring to the table, page 423, it will be noticed that there are several exceptions to the rule that cholera is most severe in Calcutta during the months of April and May—for instance, 1871, and also in 1872, the greatest mortality from the disease occurred in November and December; and, as I have already remarked, Dr. Franks, writing regarding the influence of the subsoil water of Munich in the dissemination of Asiatic cholera, has come to the conclusion that the disease increased, instead of decreasing, as the ground water rose in the soil (page 357).

There is another aspect of the question regarding the circumstances of cholera in Calcutta which certainly demands our consideration at the present time, because there can be no possible doubt that for years past the disease has existed in an endemic form among the people of that city. But if cholera is disseminated by drinking water becoming contaminated with matter passed from a person suffering from the disease, it follows if people residing in Calcutta are protected from accidents of this kind—the water-supply being guarded from contamination—that cholera should in a great measure disappear from the place. I say in a great measure, because it is well known that many of the

natives of Calcutta still drink water from wells and tanks situated within the town, and subject to any amount of defilement; and further that the milk consumed is too often adulterated with water drawn from the most abominable sources. Consequently, supposing cholera is disseminated through drinking water, we should expect that under existing circumstances the disease would continue to manifest itself in Calcutta in spite of the waterworks.

Again, the conditions of cholera among the inhabitants of Calcutta are peculiar at the present time, with reference to the drainage works now in progress. The southern part of the town which mainly constitutes "The City of Palaces," and is inhabited by the European portion of the community, has lately been effectually drained, but drainage works have not as yet been completed in the densely crowded native or northern portion of the city, consequently the bulk of the population is now, in a sanitary point of view, in exactly the same condition as it was fifteen or twenty years ago, with the exception of the advantages afforded by the new waterworks, which supply a pure, constant, and unlimited amount of water to every part of the town. From a return given me by Mr. Turnbull, Secretary to the Justices of Calcutta, it appears that up to February 1874 there were 64,524 brick houses and huts in the town of Calcutta, and of this number only 3,521 were connected with the new conservance drains.

The Calcutta waterworks were opened to the public in January 1870, but practically they were only brought

into operation during the following April, because the natives at first refused to take the water from the stand-pipes, and it was laid on to but few of our houses until later in the year. The completion of the waterworks was hardly effected before the year 1874, as we learn from a statement made by Mr. Hogg in March of that year.*

Although there is every reason to doubt the accuracy of the following returns, nevertheless, as a comparative statement of the number of deaths from cholera from year to year they are valuable, and they afford us the most authentic account at our command of the mortality

* The Chairman emphatically stated that it could not be said that the interest of the native ratepayers had not received due consideration at the hands of the justices. There was not one native ratepayer who had any just right to complain about the supply of water in the town. The mileage of roads in Calcutta amounted to about 125 or 126, and service pipes had been laid on to the extent of 104 miles, so that no more than twenty miles of the bye-lanes had not service pipes in them. It surely could not be expected by those living in the bye-lines of, say, Chitpore Road that they should have the same advantages as those who live in Chowringhee and Theatre Road, and who contribute more largely to the funds of the municipality (cries of oh! oh!). It was a recognized system in all towns, and it was absurd to suppose that small streets could expect to be placed on the same footing as more important ones. He did not think there was any injury done to the native ratepayers by the resolution. The inhabitants of Hastings were labouring under an injustice, and they had a perfect right to expect fair treatment. The northern and southern divisions of the town had no legal demands on the justices, for they were supplied with water more than they had a legal right to expect. There were four miles of piping now landing, of which it was proposed to use a mile and a half for Hastings, and the rest would be used for the northern division of the town as originally proposed, and a further supply would be brought out for the same purpose.

from cholera in Calcutta during the past ten years. The figures printed in antique type indicate the number of deaths in Calcutta since the opening of the water works :—

Statement of Deaths from Cholera Reported by the Municipal Authorities as having occurred in the Town of Calcutta from 1866 to 1875.

Years.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
1866, . .	509	826	1193	736	616	885	552	491	371	236	203	208	6826*
1867, . .	161	142	292	343	330	257	108	126	92	149	243	140	2268
1868, . .	252	205	694	591	360	174	97	395	188	350	405	352	4178
1869, . .	264	428	760	746	698	331	78	53	41	57	78	58	3592
1870, . .	171	259	257	381	165	118	50	40	30	37	22	30	1560
1871, . .	54	97	50	85	30	24	25	38	70	81	128	108	790
1872, . .	80	81	64	67	65	53	71	79	61	86	178	248	1068
1873, . .	128	187	220	163	152	93	59	31	26	24	28	29	1140
1874, . .	69	179	192	247	211	86	42	41	25	28	29	67	1216
1875, . .	130	74	260	272	119	66	32	35	48	134	332	166	1668

* The highest rate of mortality from cholera reported in Calcutta for a series of thirty years. The average number of deaths from cholera for thirty years was 3,867 per annum, as follows :—

1841, . .	5,177	1852, . .	4,189	1867, . .	2,268
1842, . .	6,545	1853, . .	5,632	1868, . .	4,178
1843, . .	3,739	1854, . .	3,082	1869, . .	3,592
1844, . .	5,811	1855, . .	3,744	1870, . .	1,560
1845, . .	6,240	1856, . .	4,540	1871, . .	790
1846, . .	6,427	1857, . .	3,838	1872, . .	1,068
1847, . .	3,041	1858, . .	5,195	1873, . .	1,140
1848, . .	2,502	1859, . .	4,676	1874, . .	1,216
1849, . .	3,867	1860, . .	6,553	1875, . .	1,668*
1850, . .	3,348	1865, . .	5,076		
1851, . .	4,374	1866, . .	6,826		

* This is a high rate of mortality, and has been followed during 1876 by cholera over the greater part of India, Burmah, and Afghanistan.

The question naturally arises, Is the diminished death-rate from cholera due to the supply of pure water provided for the inhabitants of the place?

By referring to the records of the ten years given in the above table, we find that in 1867 there were 2,268 deaths, against 1,563 in 1870. Again, we must bear in mind the fact that throughout the year 1870 cholera was by no means prevalent in Bengal, and consequently we might have expected a low death-rate from the disease in Calcutta; nevertheless, during the first four months of the year (the new waterworks not having been brought into operation), the deaths from cholera were more numerous than in the corresponding months of 1867. It was from May 1870, after the water-supply had come into operation, that we notice the marked fall in the death-rate from cholera in Calcutta.

I have remarked that we cannot depend on the figures supplied by our municipal authorities as to the number of deaths that have occurred from cholera in Calcutta, for the machinery employed in collecting these returns is of the roughest possible description. Natives receiving a salary of a few rupees a month, are stationed at the various burning ghâts and burial-grounds of Calcutta, and on a corpse being brought, either to be burnt or buried, questions are asked the accompanying relatives as to where the body came from, and from what disease the person died. The answers given form the records upon which our municipal returns are based. I need hardly observe how useless data of the kind must necessarily be, unless as comparative statements, the number of false

returns in one year probably not much exceeding those in another year. Unfortunately, however, this extremely fallacious mode of collecting our mortuary returns is not the only circumstance which renders them unsatisfactory for our present purpose, because we have no means of discovering from them if the actual number of deaths from cholera reported as having occurred in Calcutta during a certain week or month, really took place within the city, as distinguished from its suburbs: the latter being beyond the influence of our municipal waterworks. Fifty bodies may perhaps have been entered in the returns as having been brought to the burning ghâts and burial-grounds of Calcutta during the week ending the 1st of August, and of these twenty-five are reported to have died from cholera; our returns would therefore show twenty-five deaths from cholera in Calcutta for the week ending the 1st of August: but if we inquire into the matter we may discover that of these twenty-five deaths from cholera ten of the corpses came from the various Calcutta hospitals; and, further, that of these ten, eight were persons brought into hospital from our suburbs. For instance, in December 1871 three deaths from cholera took place in the native hospital; the corpses were taken to the pauper burning ghât, and returned among the "deaths from cholera" in *Calcutta* for the month of December. Nevertheless, all three of these patients had been attacked by cholera when living beyond the confines of the town: they were brought from the environs of the city and deposited in the hospital when in a dying state. It will be seen at a glance how materially cases of this kind

influence the question we are endeavouring to solve, as to the influence which our improved water-supply has had upon cholera in this town. In order, if possible, to neutralize errors likely to arise from incorrect returns consequent on imperfect knowledge as to the cause of death, and if possible to ascertain how many of those reported to have died from cholera in Calcutta were seized with the disease when beyond the influence of our improved water-supply, I applied to the medical officers in charge of the four Calcutta hospitals, and these gentlemen very kindly furnished me with figures from which the table at page 427 has been compiled.

There can be no doubt as to the accuracy of these figures, and they evidently confirm the impression produced by the study of the municipal tables, that cholera has suddenly declined of late in Calcutta.

It is also probably from the information afforded by our hospital returns that we can form an approximate idea as to the number of deaths reported as having taken place in Calcutta from cholera, which were due to causes extraneous to the influences of this city : thus, of the 179 cases treated in our Calcutta hospitals during the year 1871, no less than 37 were patients who, at the time of being seized with the disease resided beyond the confines of the town, and this large proportion of cases is consequently a disturbing influence of no small magnitude with reference to the presumed effect which our improved water-supply has had in diminishing the death-rate from cholera in this place. Nevertheless, these outside cases being returned in our municipal reports as dying from

Return showing the Percentage of Deaths to Patients Treated, and the Number of Cases of Cholera in the Calcutta Hospitals from 1863 to 1871.

	Total Number of Patients Treated, including Cholera.				Percentage of Deaths to Total Number of Patients Treated.				Total Number of Cholera Patients Treated.				Total Number of Deaths from Cholera.				Percentage of Deaths, excluding Cholera Patients.			
	Medical College Hospital.	General Hospital.	Native Hospital.	Pauper Hospital.	Medical College Hospital.	General Hospital.	Native Hospital.	Pauper Hospital.	Medical College Hospital.	General Hospital.	Native Hospital.	Pauper Hospital.	Medical College Hospital.	General Hospital.	Native Hospital.	Pauper Hospital.	Medical College Hospital.	General Hospital.	Native Hospital.	Pauper Hospital.
1863, . .	5020	1763	1160	..	19.96	7.94	16.5	..	554	95	159	..	293	41	74	..	15.87	5.93	12.2	..
1864, . .	5358	2295	1009	..	21.96	8.88	22.7	..	763	174	210	..	415	88	128	..	16.58	5.46	12.3	..
1865, . .	5210	2429	1408	..	21.47	6.99	20.2	..	595	102	246	..	324	47	126	..	17.22	5.31	14.2	..
1866, . .	5383	2416	1860	..	24.29	9.85	23.6	..	998	177	453	..	499	188	251	..	18.44	5.48	13.2	..
1867, . .	4827	2377	1367	2672	14.85	6.39	16.6	24.32	312	78	195	41	153	48	83	21	12.49	4.51	12.3	24.01
1868, . .	4342	2449	1431	4227	18.51	7.22	20.1	26.68	565	120	253	106	235	65	130	57	15.06	50.0	13.4	25.69
1869, . .	4079	2641	1681	4775	18.90	5.30	17.5	20.7	468	61	270	95	260	44	129	50	14.15	3.79	11.6	18.71
1870, . .	3774	2580	1400	3049	14.70	5.23	11.2	22.30	236	76	109	44	104	37	46	23	12.74	4.02	8.1	22.27
1871, . .	3661	2546	1441	3869	13.41	3.65	6.1	21.18	96	27	24	32	44	16	16	16	12.53	3.13	5.1	20.94

cholera in Calcutta, render the diminution in our actual death-rate from this disease the more remarkable. They are in fact a disturbing influence exaggerating the circumstances of cholera in Calcutta, making the town appear worse in this respect at present than it really is.

It may be argued, that this diminution in the death-rate from cholera in Calcutta is due to the disease having been in abeyance throughout the country. If we refer, however, to our returns, we find that, during the early part of the year 1870, cholera was more fatal in Calcutta than in the corresponding months of 1867 : and the above argument cannot possibly hold good with reference to the circumstances of cholera in 1872, 1873, and 1875, for the disease has been very virulent immediately round Calcutta during these seasons, and we have ample evidence in the pages of the *Indian Medical Gazette* since the commencement of 1871 as to the wide dissemination and the fatal character of cholera throughout Bengal. But the reduction of the death-rate from cholera in Calcutta would have been more apparent than it now is, had we been able to exclude cases incorrectly reported as dying by cholera in the town, from appearing in our returns, and to have prevented strangers carried off by the disease either within our hospitals, or brought for cremation or burial from the suburbs, being entered among the deaths from cholera in our municipal mortuary tables.

From a careful study of all the facts before me, and from an intimate personal knowledge of the place and

people, I cannot but believe that the introduction of a pure supply of water into Calcutta has been the immediate cause affecting the diminution in the death-rate from cholera which has existed during the past five years amongst the inhabitants of the place. Those who have no faith in the water *theory* of cholera (as they call it) will ask for more time before committing themselves to an expression of opinion regarding the influences at work in reducing the death-rate from this disease among the people of Calcutta, and I can only hope that the facts I have endeavoured to bring to their notice respecting that city will incline them to regard the propagation of cholera by means of water as something more than a "a mere hypothesis." They ask us for facts: I reply—Study the circumstances of cholera in Calcutta; at any rate, abstain from expressions of opinion such as the following until you have done so:—"All our efforts to stay the ravages of cholera (in India) have hitherto been fruitless. These ravages appear on each successive outbreak to be on the increase, both as to frequency and virulence, and in the present state of our knowledge our only safety consists in the withdrawal of as many of our troops as possible to the hills."* To persons holding views such as these I would remark—Try the simple plan of protecting those committed to your care from consuming cholera-polluted water (including milk), and rest assured that results similar to those effected by this means among the population of Calcutta

* Dr. Muir, Inspector-General of Hospitals, H.M.'s British Troops, *Army Medical Department Report*, vol. XI, p. 281.

will follow your efforts. Neglect these simple precautions and you may well advise a flight to the hills or any other impracticable scheme; but neither this nor *any other means, however costly or elaborate*, will suffice to protect you from the influences of epidemic cholera, if you allow contaminated water to be consumed, in the hills or anywhere else, by those whose well-being is committed to your care. In giving this as my deliberate opinion, I would affirm, as I have frequently done before, that I do not hold that cholera can be propagated from man to man *only* through means of drinking water; I believe contaminated water and milk to be the most frequent means by which the disease spreads over India, especially in those instances of local outbreaks of cholera which we so frequently witness in that country amongst the inhabitants of our towns, villages, barracks, and prisons.

Nor are we without experience in this matter with regard to other localities than Calcutta, for Professor Forster of Breslau has lately published a paper on "The Spread of Cholera by means of Wells." A list of towns which have never had large epidemics of cholera, although surrounded by it on all sides, have all had a pure water supply conveyed in pipes from reliable sources. He also gives a register of parts of the same town which invariably escaped, although other parts of the same city were attacked. The former have good water-supply, the latter foul wells and pumps. For instance, the Orphan Asylum at Halle, standing on a hill and having a separate and pure water-supply, has never been attacked by

cholera, although the disease has been very severe in the city. *

We may however take a still more remarkable case of this kind in the regiment (European) 'stationed at Fort William, Calcutta. Major Tucker, R.E., writes me word that "according to our account the Fort water-supply appears to have commenced in May 1865." I will not describe the change thus effected in the water distributed to the troops in Fort William as compared with what it had been previously, but I can assert from personal observation that from the date mentioned by Major Tucker, the European soldiers in Fort William had been supplied with pure drinking water, whereas previously to that time no care whatever had been paid to the water ; and the result is marked in the following return as bearing upon the death-rate of our troops from cholera residing in the very *Home of the Disease*—

Year.	Strength of Regiment in Fort.		Number of cases of Cholera.		Number of Deaths.	
1826	.	603	.	84	.	46
1827	.	901	.	40	.	18
1828	.	925	.	26	.	13
1829	.	896	.	46	.	14
1830	.	720	.	57	.	11
1831	.	843	.	17	.	4
1832	.	733	.	19	.	2
1833	.	685	.	20	.	5
1834	.	602	.	10	.	3
1835	.	738	.	15	.	0
1836	.	732	.	7	.	0
1837	.	1,099	.	7	.	1

* *Cholera Epidemic of 1873 in the United States*, p. 86.

Year.	Strength of Regiment in Fort.	Number of cases of Cholera.	Number of Deaths.
1838	623	126	—
1839	667	9	2
1840	733	37	17
1841	692	69	23
1842	954	118	59
1843	1,014	24	15
1844	506	15	7
1845	457	29	14
1846	1,007	31	21
1847	467	5	2
1848	758	12	9
1849	883	5	4
1856	543	66	41
1857	—	—	73
1858	770	92	55
1859	1,311	14	9
1860	1,198	59	40
1861	1,050	18	9
1862	880	16	13
1863	745	5	4
1864	790	7	2
1865	789	0	0
1866	861	4	2
1867	739	3	2
1868	858	5	5
1869	924	0	0
1870	875	2	2
1871	891	0	0
1872	828	2	1

Individual commanding officers have, however, often done much to preserve their men from the effects of cholera in India by attending to the supply of water which they consume. A very marked instance of this kind occurred in H.M.'s 77th Regiment at Agra in 1869. Colonel Kent, at this time, not only got up admirable

sand-filters for the use of his regiment from Calcutta, but every morning he went into the barracks and looked after these filters himself, entreating his men to drink no water except that drawn through the filters. This officer had a wonderful influence over his men; they strictly followed out his recommendation, and it is without question that although cholera visited Agra in 1869, and the European artillery and the native infantry suffered from the disease, not a single man in Colonel Kent's regiment contracted cholera.

On the other hand, the Civil Service surgeon of Howrah, one of the suburbs of Calcutta, argues from his hospital returns, that as there has been a diminution in the cases of cholera treated in the Howrah Hospital since 1870, and as there has been no improvement in the water-supply of that place, consequently we must look to some general cause as influencing the disease independently of this drinking water. I have given Dr. Bird's figures below, * and it seems to me he overlooks the fact

* Cases of Asiatic cholera treated in the Howrah Hospital.

Year.	Europeans.	Died.	Natives.	Died.
1864 . .	32 . .	16 . .	80 . .	21 . .
1865 . .	47 . .	18 . .	55 . .	14 . .
1866 . .	68 . .	32 . .	67 . .	22 . .
1867 . .	17 . .	8 . .	33 . .	15 . .
1868 . .	32 . .	15 . .	43 . .	13 . .
1869 . .	54 . .	15 . .	31 . .	11 . .
1870 . .	21 . .	7 . .	18 . .	5 . .
1871 . .	8 . .	2 . .	31 . .	9 . .
1872 . .	13 . .	4 . .	45 . .	15 . .
1873 . .	9 . .	6 . .	46 . .	28 . .

These returns are copied from the *Report of the Medical Institutions of Calcutta*, by Dr. Kenneth M'Leod, vol. 1873, p. 71.

that most of the Europeans admitted into the Howrah Hospital are sailors from vessels in the Hooghly. These men formerly contracted cholera in the Calcutta bazaars, and when ill were sent to the Howrah Hospital for treatment. It must not for an instant be supposed that the Europeans mentioned in this return are the fixed population of the place. On the other hand, according to Dr. Bird's own returns, it does not seem that the mortality among the natives of Howrah, as exhibited by the hospital returns, has fallen in the same proportion as that of the Europeans, for in 1873 it was actually higher than it has ever been before, whereas the number of deaths among the Europeans was lower than it had ever been with the exception of one year. I may further remark that all vessels in the Hooghly are now bound to supply themselves with water drawn from the municipal works. This fact would naturally diminish the death-rate of the sailors admitted into the Howrah Hospital suffering from cholera. It is remarkable how directly this supply of pure water to our ships has lowered the mortality among emigrants on their voyage from Calcutta for the Mauritius and West Indies.

I must now pass on to consider the geographical distribution of cholera, with reference to the routes it has followed in its progress from its endemic area in India over the face of the earth.

One of the principal objects I had in view, in writing a detailed history of the disease, was, that I might give quotations and references to various contemporary authorities on the subject of each visitation of the disease, written,

however, by men in different countries and in various languages, having no further object than to record what they saw of the disease. A bare statement as to the extension of epidemic cholera over the face of the earth, especially if brought forward as evidence in favour of some particular theory, would be hardly likely to carry conviction with it, the more so as the progress of the disease is so remarkable, that a statement of the case, unsupported by facts, would appear to many men as bordering on the marvellous, and for that very reason deserving to be rejected. I would therefore beg those who are interested in this subject to wade through the details I have given in my history of the disease, for unless they take this trouble they will not be in a position to form an opinion as to the nature of cholera.

One of the first things that strikes us in this history is that in every instance in which cholera has extended beyond the confines of its endemic area, it has originated in an outburst of the disease in Lower Bengal, or in Madras, as in 1833-34. As a general rule cholera has two well defined routes from Bengal westward, the one is along the basin of the Ganges into Nagode and Saugur, and from thence into the Bombay Presidency. The other its north-west route from Cawnpore (or up the Jumna) to Agra, and Muttra, to Delhi and so over the north-western provinces into the Punjab.

It appears very certain that the course usually followed by cholera, in its advance westward into Europe from India, has been either along the Red Sea (notably from

Mecca) into Egypt, or else along the shores of the Persian Gulf, and up the Tigris, or Euphrates into the north of Persia or into Turkey in Asia, passing into Europe *via* Astrachan, or else gaining Orfa and Aleppo, and so reaching the Turkish dominions in Europe. Its passage in this direction is impeded at present on account of the difficulty presented in the navigation of the Tigris and Euphrates, the country to the west of the former river being protected by the desert separating Bagdad from Syria.

It is evident, however, from a perusal of the history of the disease, that cholera has on several occasions travelled from the Punjab into Cabul, appearing at Herat, and from thence extending to Mushed, Teheran, and Tabreez, or along the shores of the Caspian Sea. It followed this course in 1829, 1845 (from Cabul), and in 1853. Each of these years was followed by an outburst of cholera over the north of Persia, and its extension into Europe over the Caucasus mountains, or more commonly by the sea route from Reshd to Astrachan.

I need hardly observe that the route I have indicated, as being the course followed by cholera in its passage from Bengal to Western and North-western India, and from thence to Arabia, Persia, or Mecca, is clearly that by which the natives of these various countries travel as I have fully explained in the first chapter of this work. I say advisedly the natives, because it is certain that cholera has never yet reached Suez by means of the Peninsula and Oriental Company's steamers, although it has without doubt been imported by pilgrims passing up

the Red Sea from Mecca in several instances. Mecca and Kerbella are extensively resorted to every year by pilgrims from India; besides this, there is a very considerable trade kept up between the various ports of India and Muscat, Makalla, Mocha, and Jeddah, and still more extensive commercial relations between India and the various ports (particularly Bassorah) on the Persian Gulf. Among the various articles carried directly from India to Persia are the bodies of Mussulmans—some of whom to my certain knowledge died of cholera—to be buried at Kerbella.

And so again in the passage of cholera from the west and north-west of India, it evidently travels with human beings through Peshawur and the Kyber pass, or else from Dera Ismael Khan to the Kattawaz plain, south of Ghazni, this being the great caravan route from the Indus valley to the Candahar Steppes. It may also pass from the west of India *via* the Bolan pass into Afghanistan. From this latter country the disease has on several occasions travelled *via* Herat into Persia; and this is the only possible route it can take westward by land into Persia, the deserts of Rajpootana, and those again of Beloochistan, protecting Persia from the disease, except by way of Herat, or by sea from Bombay and the Persian Gulf.

I shall not enter further on the geographical distribution of the disease after it has once gained access to Europe. Its ramifications then become as numerous as those followed by men in their wanderings to and fro, and I have already given a general outline of the

subject in connection with the history of the disease. Nor is a more extensive inquiry into this matter of the same interest in a practical point of view, as the distribution of the disease immediately beyond its endemic area—a subject more properly belonging to the measures necessary to prevent cholera from being carried beyond the confines of India, and sown broadcast over the face of Europe and America. For this wide-spread distribution of the disease, the inhabitants of these countries have to thank England; for although it has not been her countrymen who have in their own persons disseminated the organic material that produces cholera over the globe, it has been and is in her power, as ruling over the endemic area of the disease, to prevent her native subjects from extending this terrible pestilence beyond the confines of British India.

THE BEARING OF METEOROLOGICAL INFLUENCES UPON
THE SPREAD OF CHOLERA.

SOME of the earliest records we possess upon the subject of cholera refer to the supposed influence of the wind over the disease. Fra Bartolomeo in 1796 says that the natives on the Malabar coast believed that cholera was caused by the cold winds from the Ghauts. In more precise accounts of the malady, as, for instance, that of Dr. MacRae in 1818, we find great stress laid on the intimate connection between the east wind and cholera. The Bengal Medical Board, in their report on the cholera of 1817-18, confirmed this view, although they hesitated to express an opinion as to the nature of the apparent connection between cholera and the easterly wind. But the Board expressly stated their belief, that of all the predisposing causes to cholera, the one most frequently and unmistakably in operation was "alternations of heat and cold combined with rain, or a very humid state of the atmosphere." *

The history of cholera in India is full of similar accounts of the weather during various outbursts of the disease, and in every instance it is asserted that the meteorological phenomena were similar to those described in the above extracts from the Medical Board's report of 1820. I would not have it understood, how-

* Jameson's *Report*, p. 163.

ever, that I contend that cholera has never broken out in isolated localities, as in Southampton, for instance, in 1865, unless in very wet weather. In India the cold, hot, and rainy seasons are constant and well marked, and succeed one another in regular order, and we are, therefore, far better able to judge of the influence they exert upon the spread of cholera than residents in Europe can be.

But it will be observed, as in the instance described of the 1st Fusiliers at Cawnpore in 1848, that excessive rain may at times seem to remove the disease instead of increasing it. The regiment had been shifted from one barrack to another, without any apparent benefit. On the 1st of September they marched out into camp, and on the 6th and 7th there was continuous heavy rain, so much so that the camp was flooded, and the regiment returned to cantonments on the morning of the 8th. On this Dr. Bruce observes, "the move had the desired effect, for although we found the disease raging in the city and bazaar as severely as before we went out, not a single case occurred in the regiment from that time forth." It was precisely the same with the 31st Regiment at Umballa in 1845, and we might multiply instances of the kind.

Similar phenomena are witnessed on a large scale in the province of Bengal. Cholera is at its height there every year in March and April, and again in September and October, and these are the very months in which we get heavy downpours of rain, washing the surface soil and its contents into the wells and tanks

from which we procure our drinking water ; these storms are generally followed by intensely hot days. As soon as the regular rains set in, and we get a more or less continuous downpour for some three months, cholera ceases for the time, and in fact until the close of the year, when it breaks out again in the stormy weather which, with intervals of intensely hot days, succeeds the rain.

The law which I am endeavouring to elucidate is simply this, that cholera in India is epidemic after downpours of rain followed by intensely hot weather. A country deluged with water is not so likely to be the scene of epidemic cholera as one under the circumstances above described. In districts absolutely free from moisture cholera can only be generated to a very limited extent.

There is an exception, however, to be made with respect to the comparative immunity of a country inundated with water. During a heavy downpour of rain (I am speaking of the tropics), supposing the inhabitants of a town or barracks to be under the influence of cholera, the disease will probably diminish as the superabundant rain reaches the earth ; but as a downpour of this kind can only last for a limited period, say five or six days, and as in all likelihood a few cases of cholera or cholerine continue to occur in the locality during this period, the disease is prolonged through the heavy rains, and directly the weather clears up there will be a renewed outburst of cholera, unless under some exceptional circumstances, such as those of the 1st Fusiliers at Cawnpore. In that case the whole of the

regiment, including the cholera cases, were removed from the infected locality during the rain, and the inundation of the country was clearly attended with marked benefit.

I may now endeavour to explain what I conceive to be the influence which the monsoons exert upon the extension of cholera over India. When the sun is to the north of the equator the desert of Gobi and the arid wastes of Central Asia become intensely heated, a vast volume of air covering them expands and ascends, causing an indraught of cool air from the surrounding medium. In this way a volume of air laden with moisture from the evaporation taking place in the Bay of Bengal is drawn northward and eastward, causing our south-west monsoons. Now, the effect of this water-carrying wind is felt over Lower Bengal in the form of storms from the north-west, in February, March, and April, and towards the end of May or middle of June the regular rains set in; the farther west the later the rains, so that at Cawnpore they hardly commence before July, when they are also felt over the north-west provinces and Punjab.

I have had to record the progress of cholera on several occasions from Eastern Bengal, during one season, as far to the west and north-west as Allahabad and Cawnpore, a few cases at the same time occurring in the principal cities situated on the River Jumna—at Agra, Muttra, and Delhi. During the subsequent rains the whole of the north-west and Punjab have been under the influence of the disease. It seems to me that these facts are best explained as follows: When the south-west monsoon sets

in over Bengal, the River Ganges becomes the great high road of traffic between the home of endemic cholera and the north-western provinces. After the cold-season crops have been gathered in, and the monsoon has fairly begun to blow over Bengal, large fleets of country boats start on their journey from Calcutta, Dacca, and other emporiums of trade, for Patna, Benares, Allahabad, Mirzapore, and Cawnpore, which latter place they reach about August.* A few of

* The total number of country boats which passed Sahebgunge during the year 1873 were—

Up-Stream Traffic.

	Loaded Boats.	Passenger Boats.	Empty Boats.	TOTAL.
January, . . .	1,105	11	533	1,669
February, . .	1,308	31	444	1,783
March, . . .	1,361	91	426	1,878
April, . . .	764	19	496	1,279
May,	1,472	19	513	2,004
June,	1,499	13	339	1,851
July,	1,055	12	277	1,344
August, . . .	1,821	25	273	2,119
September, . .	1,515	24	347	1,886
October, . . .	1,132	33	483	1,648
November, . .	1,115	34	417	1,566
December, . .	892	20	425	1,337
Total, . . .	15,039	332	4,993	20,364

these boats sail up the Jumna as far as Agra and even Delhi. They return to the lower provinces before the Ganges subsides in September.

The south-west monsoon, therefore, would appear to be the indirect cause of the dissemination of cholera over the country, in that it brings with it moisture—a necessary element for the development of the disease—but more especially because it is before this wind that the large fleets of country boats move up the Ganges, conveying men and goods from the home of endemic cholera to be disseminated over the upper provinces. Thus the disease springs up, not only in the great cities on the Ganges at which these boats stop, but it also appears in the large towns on the Jumna. We have in these details a repetition of the old story—cholera progressing with man along the great high roads upon which he travels, spreading no faster than he moves, and being generated in wet and hot weather.

No sooner do the rains cease, and the dry west winds of the upper provinces set in—at the latter end of September or beginning of October—than cholera begins to decline over the north-west. In Bengal the rains cease later in the year in showery weather, and a fresh outburst of the disease then occurs.

In the north-west, as I have above stated, cholera begins to decline in September, and from the end of that month until the following June there is often hardly a drop of rain over these provinces; the disease consequently remains in abeyance (unless under exceptional circumstances), extending its influence over the country

when the next south-west monsoon arises, bringing with it moisture to enable the material cause of cholera to break forth into renewed life, and recommence its awful work on the bodies of those subjected to its influence.

We have seen, however, that an outburst of cholera may occur earlier in the year over the north-west, as, for instance, at Hurdwar in the spring of 1783, and in April 1866; but these cases hardly form an exception to the rule above laid down, for it will be remembered that Dr. MacRae expressly states that in 1783 cholera broke out after an east wind and rain; and in 1866, three million pilgrims being collected at Hurdwar with cholera among them, down came a pouring rain which lasted nearly twenty-four hours, and on the very next day we hear of that outburst of the disease which we have traced over the whole of the north-west into the Punjab, Cabul, and Teheran.

I am perfectly aware that it has been maintained by observers as far back as 1818, that the south-west monsoon has a far more direct influence in spreading the disease over the country than I am disposed to attribute to it. I cannot, however, accept the notion of the monsoons being the direct means by which cholera is directly disseminated over India:—

1st, Because we find that people living on the hills of Lower Bengal, and therefore under the influence of winds blowing over the endemic area of cholera, are yet free from the disease.

2nd, The wind has never conveyed the disease from the coast of Burmah or India to the Andaman Islands.

3rd, We have the direct testimony of independent observers that, in the great epidemic of 1818, cholera advanced down the Madras coast and across to Bombay *against* the prevailing monsoon. Again, in 1849, Dr. Leitch informs us that cholera advanced from the east in the teeth of the south-west monsoon, then blowing with a force equivalent to a velocity of twenty-five miles an hour.

4th, If the south-west monsoon carries the seeds which engender cholera in the human body from east to north-west as far as Cawnpore, why does it stop there? The disease should be disseminated over the whole country, including the north-west and Punjab, every year, if carried by the prevailing wind.

5th, It is impossible to explain the extension of cholera from Alexandria over Europe in 1865, and its steady progress from east to west over Europe and America on previous occasions, upon any theory which obliges us to accept the wind as the chief influence which causes the spread of cholera.

6th, Still less can we explain its advent in isolated localities, as the Mauritius, Fogo, and Guadaloupe, and numerous other places, if we accept the monsoon theory.

7th, Quarantine when practicable, as at Peterhouff in 1831, in Palermo in 1865, and on several occasions in Greece, has prevented the ingress of cholera into these places, which could not have been the case had the disease spread by means of the wind.

In fact, I think the conclusions arrived at by the

Cholera Conference of Constantinople on this subject, "that cholera is scarcely ever carried beyond a very short distance by the agency of the open air (let us say 109·36 yards as an approximate idea of what we mean), and that in the immense majority of instances the transmission does not extend as far as this." *

Without going further into the question of the meteorological conditions which favour the generation of cholera over the face of the earth, I may observe that the results of Mr. Glaisher's investigation of the subject in England very nearly coincide with those derived from observations made in India. I have already given a summary of his researches when discussing the history of the cholera of 1854: High barometric pressure, excessive night temperature and hazy air, with absence of wind, of ozone, and electricity, have characterized all those seasons in which the disease has been epidemic in London. With regard to rainfall, it is hardly possible to appreciate its influence on cholera in England; moreover, what the rain does in India towards spreading the disease, water companies and rivers from time to time accomplish in England; in the one case rivers, tanks, and wells are contaminated by the dejecta of cholera patients, which according to the custom of the country are broadcast over the soil, or thrown into open drains, to be washed into tanks and other sources of drinking-water by heavy showers of rain. In England, water companies appear occasionally to distribute contaminated water through their pipes, or the leaking underground drains and cesspools allow their contents to flow

* *Proceedings of International Sanitary Conference*, p. 128.

into the rivers, wells, and other sources from whence drinking water is obtained.

Before passing on to the next section I must make a few remarks upon the apparent influence which heat and cold have over the generation and spread of cholera.

As a general rule, it may be stated that cholera will not extend during the cold of a European winter, or even of our Punjab cold season. We have, probably, no better exemplification of this law than in the instances of the cholera outbreaks in America in 1849. The "New York" arrived in Staten's Island with cholera on board, but soon afterwards a sharp frost intervened; the weather, though previously mild and temperate, became wintry, and the disease entirely subsided. On the other hand, the "Swanton" arrived in New Orleans at the very same time, but the streets were reeking with moisture; heavy fogs overhung the city till late in the morning; the thermometer rose to 84° , and the air was so liberally charged with moisture as to impart a stifling sensation. Under this condition of things cholera spread with great rapidity.

Similar facts were noticed in Charlestown in 1832; the brig "Amelia" carried cholera into the place during the month of November, but it failed to spread in the town.

We have observed over and over again how cholera has declined in Europe as winter has set in, and broken out again in the summer, demonstrating the fact that a low temperature tends to retard the progress of the disease. I am aware that cholera has sometimes extended its ravages in the winter season, as in the army of

Poland in the winter of 1830-31 ; but we must take into account the high temperature at which many of the hospitals and houses in Russia are maintained during their long winter. An exceptional circumstance of this kind, therefore, does not invalidate the law that a temperature below 40° Fahr. is sufficient to stay the progress of epidemic cholera, and when the thermometer stands even as low as 50° it will often sensibly affect its power of diffusion, especially if the weather is dark and gloomy.

The disease is most active when the thermometer stands at from 70° to 80° Fahr., or even 94°, in India, rising in the sun to 120° and upwards.

With regard to the supposed influence of certain states of the atmosphere, having reference to the amount of electricity and ozone it may contain, generating cholera in the human body, we have no evidence in favour of such views, and reason points out to us the extreme improbability of any such agencies producing cholera, because we find the inhabitants of the Andaman Islands and the Rajmahal Hills almost free from the disease, although living under the same atmospherical conditions as the people around them, who are constantly subject to cholera. The same train of reasoning applies to the case of Australia and other countries as yet free from cholera, in contrast with Europe and America, which have so often been affected by it.

APPENDIX.

CHARACTERISTIC FEATURES OF ASIATIC CHOLERA— PRECAUTIONS AGAINST INFECTION FROM CHOLERA.

I. *The unequal and very partial distribution of cholera forms the first of its characteristics which I shall notice.*—Mr. Jameson in 1820 most distinctly and forcibly refers to this fact : he remarks upon the localized power of the disease as being one of its characteristic features in the north-western provinces, but as having been wanting in Lower Bengal (its endemic area) ; and from his time down to the present day we find epidemic cholera presenting precisely the same phenomena.

We can hardly have a better proof of this than by referring to Dr. W. Farr's map of the various places affected by the disease in England, during those years in which the country has been under its influence, or by following the history of cholera in our Indian jails. Mr. Jameson informs us that the prisoners in the Alipore Jail were free from the disease in 1817, although it was raging outside the walls of the prison ; and even more remarkable was the case of the convicts confined in the Allahabad Jail, who were daily employed in the streets of the infected city, and yet escaped the influence of the disease.

This localized action of cholera, whether occurring in countries, towns, villages, or however small the community may be, is, in fact a characteristic which is more readily admitted than any of its other distinctive features, and it is a most important factor in our argument concerning its etiology, for we can hardly conceive limited outbursts of disease, such as mark the progress of epidemic cholera, to be due to any general atmospherical or (as they are commonly called) epidemic influences ; this localized action must be associated in our

minds with some more tangible and specific cause than an imaginary something, floating about in the air, or carried by the winds from place to place.

I am convinced that if we would rightly appreciate the circumstances of cholera we cannot too strongly impress upon our mind's eye this most prominent and universally accepted feature of the disease.

II. *The second characteristic of cholera which we may notice is hardly peculiar to this disease ; the inhabitants of certain localities are especially liable to be visited by cholera, and these localities have features in common with one another, differing from other places which have usually escaped its influence.*—As a general rule cholera has been most destructive in large sea-port towns, and the majority of these are built on low-lying, alluvial soils, at the mouths of rivers ; they are frequently densely populated.

We can hardly admit that the characteristic feature of the disease above noticed is due simply to the circumstance of the population of these towns inhabiting low alluvial soils, especially when we consider how very virulent the disease has been at times in places built on high elevations and even on lofty mountain ranges. We naturally look for some more general cause influencing the populations of all densely-peopled cities, and which would be applicable to the circumstances of the poor of all countries and nations. It seems probable that in this lies the secret of cholera committing the greatest devastation among the inhabitants of large towns—they constitute, numerically, the bulk of our population; and their habits of life, poverty, and the nature of their dwellings render them less capable of resisting a disease like cholera, than those who live in greater affluence and under more favourable hygienic circumstances.

I have remarked, in my definition of cholera, that persons in an exhausted or bad state of health are most susceptible of the influence which engenders the disease, and it is hardly necessary for me to argue the point, that the poor of our large towns are, as a general rule, in less robust health than those living in rural districts; the former become pale and anæmic, their blood is poor in red particles, and it is probable that the secretions of their stomachs and intestinal canals become impaired, inducing a state of the system, which is, beyond all others, favourable to cholera. In this way, therefore, and by the fact of the accumulation of a considerable number of the

inhabitants of the civilized parts of the world in large cities, we may account for the prevalence of cholera among such communities; the people are in a less perfect state of health than those living on high land, whose occupation is for the most part agricultural, leading them to pass the greater part of their lives in the pure and invigorating atmosphere of the country.

We may allow, for the sake of argument, that the food of both classes is equally nourishing; but with regard to water we cannot place them by any means on an equality. In the country, the population being scanty, there is far less chance of the drinking-water becoming contaminated with the dejecta of persons suffering from cholera; and on high lands, accidents of this kind must be even less frequent, on account of the natural drainage of the country towards a lower level, and because much of the drinking-water consumed would be drawn from small but rapid streams, having their source in pure springs among the hills. The reverse of all this is to be found in low-lying seaport towns: the lower the level the more sluggish the surface and underground drainage, and the more likelihood, therefore, of the accumulation of contaminated water in drains and cesspools; and the less the chance of its finding a natural outlet, the greater the probability of its percolating into wells and other sources from which drinking-water is supplied. The influence of rain, again, over these low-lying localities must often be very deleterious, making cesspools overflow, bursting drains, and in fact disseminating all the filth of our large cities into many of their almost stagnant rivers and wells, and that, occasionally, in spite of their being protected by the best of all remedies under the circumstances—a good and free supply of water delivered by properly organized water companies.

A third characteristic of cholera I have to notice is, that no amount of overcrowding, no special condition of the soil, nor any circumstance with which we are acquainted, has ever been known to originate Asiatic cholera de novo among men removed from its endemic influence, or unless the disease has been epidemic at the time beyond the confines of India.

For a confirmation of this distinctive feature of cholera I must appeal to the history of the disease, for in no single instance can I discover a well authenticated case which would form an exception to the above rule.

We have traced Asiatic cholera on several occasions to the Mauri-

tius, but always after the arrival of vessels from India with persons on board who had been among those suffering from cholera. The same thing has occurred in America, Guadaloupe, the islands of the Grand Canary group, and so on. In fact, I may with confidence challenge any one to cite an instance of epidemic cholera occurring beyond the precincts of British India, unless connected by a direct chain of cases with an outbreak of the disease in India. I do not say that it is always possible to trace cholera immediately from man to man in its progress over the world for two reasons: First, because our evidence must frequently be wanting in precise data; and, Secondly, because articles of clothing or goods soiled with the dejecta of cholera patients are capable of propagating the disease.

And here let me draw the reader's attention to the facts, that Australia and other large tracts of country have as yet been free from Asiatic cholera, and that these places are separated from India by extensive oceans or seas; on the other hand, that as communication with Europe has become more constant and rapid, so has epidemic cholera become more frequent in its visits to that continent, invariably pursuing the route followed by man in his passage to and from India, halting for a time in intermediate countries where the seeds of the disease have been sown to bear fruit in due season, whence fresh germs have been again transmitted to other men who have carried it a step further towards the west. Thus has the malady been propagated from one human being to another until its influence has spread from the east as far as the western shores of America. But cholera has never appeared in America unless Europe has been first affected; it has never broken out in the west of Europe unless the eastern part of the continent has been previously under its influence; and it has never been generated in the east of Europe unless connected with an outburst of the disease in Turkey-in-Asia, Arabia, or Persia; nor have these countries been affected until the disease had previously burst out with violence over Bengal, and travelled by steady steps to the west of India.

A fourth characteristic of epidemic cholera is, that its intensity varies during its continuance in a country or a large town, so that it has periods of little and great activity, in fact, usually well marked periods of increase, culmination, and decline. This characteristic feature of cholera has frequently been adverted to in these pages under the terms of "outbursts" of cholera, and so on, expressing the ex-

tremely rapid way in which a community, probably previously healthy, have suddenly been smitten with cholera. Whenever the disease has appeared either in India, Europe, or America, we have had numerous instances of this kind brought to our notice. Take, for example, the advent of cholera in Paris in 1831: M. Gendrin informs us that, on the third day of the appearance of cholera in the city, he received patients into the Hôtel Dieu from every quarter of Paris. The same rule holds good in instances of small communities as well as of large ones; and as a general rule the first outburst of the disease is the most malignant. We find this fact also illustrated in the case of the Paris epidemic above referred to; for, of the first ninety-eight cases admitted into the hospital, no less than ninety-six died. Instances of a similar kind are constantly presented to our notice in the history of cholera among our European regiments and native convicts in India. The disease usually declines far more gradually than it commences, and often exhibits periods of renewed activity; these, however, become fewer and less virulent in the course of time, and finally the malady disappears from the affected locality, perhaps to burst out in some neighbouring town or province with a repetition of the same phenomena.

I have alluded to meteorological changes as influencing the spread of cholera over India, but we can hardly accede to this cause (well marked as its power undoubtedly is on a large scale) any such subtle influence as that which evidently governs these local outbreaks of disease. For example, in the instance again of Paris, in 1831, we find certain villages in its neighbourhood severely visited by cholera while others absolutely escaped. We cannot explain a circumstance of this kind by supposing that the atmosphere over Paris differed materially from that in these villages, and still less that the atmosphere of one village was different from that of another village within a few miles of it. No doubt facts of this description have tended to throw a mystery around this disease, which has been intensified by the terrible malignity and the suddenness of its attack.

I must confess that I hardly find any of the prevailing views as to the *modus operandi* of the causes which are supposed to produce cholera in the human body, to account satisfactorily for this feature of the disease. But supposing we believe that cholera is mainly propagated by the excreta of those affected by the disease finding their way into the drinking water, and that it is only in a certain

stage of decomposition that this organic matter is capable of exciting a similar action in the intestinal canal of those who swallow it, we may thus explain much which otherwise appears very mysterious in connection with cholera. The development of this idea, and the facts with which I shall attempt to raise a superstructure upon it, must remain for subsequent consideration. But I may here remark that, if we allow the possibility of the Seine having been contaminated in the manner I have suggested in 1831, and suppose that its waters became poisonous when this organic matter was in a certain stage of decomposition, and that this condition gradually declined as oxidation progressed, the water after a certain period no longer containing decomposing choleraic dejecta in a dangerous state, we may thus account for the sudden onslaught of the disease.

The intensity of this poison would be greatest probably within twenty-four hours from the introduction of the cholera-stuff into the water; but this would vary with the depth of the water, the state of the atmosphere, and so on, meteorological changes influencing to a considerable extent the intensity and length of time of its decomposition, supposing, of course, the water to be once only contaminated. If the organic cholera-infecting matter found its way from time to time into the drinking water, then, as each successive quantity of the nitrogenous stuff passed through a certain stage of decomposition, a fresh outburst of the disease would occur among those who partook of the water at that particular period.

I maintain that this idea, if supported by fact, demands our serious consideration; for, as I have said before, we may thus account for the suddenness of the outbreak of cholera: moreover, it explains the fact that epidemic cholera has invariably sprung from a pre-existing source of disease; that it is impossible for it to break out in a locality beyond its endemic area, unless the organic matter from another person suffering from cholera has been introduced into the place through the agency of man; and that as decomposition cannot be set up in organic matter, unless with the aid of moisture and a certain temperature, so cholera depends greatly for its diffusion upon drinking water and the range of the thermometer. Lastly, this contaminated water must be swallowed during a particular stage of the decomposition of the organic matter in order to produce any ill effects, for as oxidation goes on the water purifies itself, and in the course of a few days becomes innocuous.

I believe we must adopt some such theory as this to account for those characteristic features of cholera which we are now discussing; a freshly contaminated water explains the outburst of the disease, the oxidation of the organic matter its decline. We may in this way explain how certain villages around Paris escaped the influence of cholera, while others were terribly affected by it; supposing, in the first case, that the drinking water had escaped contamination, and in the other that choleraic matter had been introduced into it. An explanation of this kind is, of course, no less applicable to the case of other cities and countries than to that of Paris; in fact, if the history of cholera be read by the light of such theory as this, much which is otherwise dark and mysterious becomes comparatively easy of comprehension, and apparently discordant facts range themselves into intelligible order; and we have some weighty facts to adduce in favour of this argument, although it is necessary before handling them to endeavour to clear away much of the jungle which entangles the subject—the growth of years, of which we must be rid before we can hope to work the soil we are breaking to advantage.

A fifth characteristic of cholera is that, after having been a certain time epidemic in a locality, it entirely disappears, unless in its endemic area. In considering this feature of the disease we must again appeal to its history. I have already pointed out the fact that cholera is hardly endemic in any country beyond the Peninsula of India, the eastern provinces of the Bay of Bengal, and Java. It has appeared over Europe and America on several occasions, but after exercising its baneful influence for a period of two or three years it has gradually died out and disappeared, until again rekindled by a fresh importation of the disease from India. Like certain tropical plants, cholera appears incapable of a long continued existence beyond the region from which it originally sprang; it may, however, live and bear fruit even in the cold of a European winter if fostered in carefully warmed conservatories, as, for instance, in the overheated houses of the Russians. Unless cared for in this way, it becomes dormant in the cold of a European winter, to sprout out again in the heat of summer, but with less vigour than in the year of its primary invasion.

As regards this feature of cholera we cannot explain why the disease does not continue in vigorous growth in Europe, or, in fact, in any part of the world beyond India, but we may surely rest content with a statement of the fact. It is equally impossible to explain

why certain plants and animals can only flourish in particular regions of the globe; why, for instance, we cannot keep up a vigorous European stock of human beings in India. We know this cannot be, and in the present state of our knowledge must be content to receive the statement as true because experience teaches us that it is so. And so with cholera: we know no physical laws which can account for the limitation of endemic cholera to India, nor why the disease gradually dies out after a few years of life and vigour in any other country; but this in no way detracts from the certainty or value of the facts. This feature, moreover, does not exclusively belong to epidemic cholera, but is common to other zymotic affections, as scarlet fever, which is unknown in an epidemic form in India, or yellow fever, which can hardly exist in the north of Europe.

Facts such as these appear in a clearer light when viewed in connection with others of an analogous kind with which we are more familiar. Much of my experience of cholera was gained in the district of Tirhoot, a great indigo-producing country, and every planter knows very well that if he would get good produce from his plant, he cannot rely on the indigenous seed, he must import it year after year from the north-west; if he sows seed from plant reared in the district he may have a fine crop, but he will get little or no produce out of it. He acts upon the experience he has gained, and imports his seed from localities far less famed for their indigo than Tirhoot; but this imported seed yields largely in that district. And so it is with cholera: the imported disease is terribly prolific and fatal in its first year's growth on a new soil, and from that time it deteriorates in its power of destroying life and gradually declines.

We find this same character further illustrated in the case of newcomers into a locality under the dominion of cholera; here the virgin soil is brought to the seed, but the same effects as in the former case have been noticed over and over again, and notably in India among the inhabitants of the Rajmahal hills. In other parts of the world facts of a similar kind have been observed, as on the arrival of recruits in the Crimea when the country was under the influence of cholera.

A sixth characteristic feature of epidemic cholera is, that every outbreak of the disease beyond the confines of British India may be traced back to Hindostan, through a continuous chain of human beings

affected with the disease, or through articles stained with their dejecta.—In other words, the train of phenomena resulting in cholera beyond the confines of India must have commenced in this country ; consequently America, Europe, and the greater part of Asia may justly blame India for all they have suffered from cholera.

I have already entered somewhat at length into this subject when discussing the geographical distribution of the disease, nevertheless I must briefly touch on it again. It is to my history that I appeal in proof of the above statement ; I have there given an account of the gradual advance of the disease from Bengal over the north-west of India, and into the Punjab, Cabul, and Persia ; or from Bengal to Bombay, Persia, Arabia, and Turkey in Europe, on every occasion in which the disease has appeared in Europe. Cholera has in this course invariably followed the routes by which man travels, and if it has thus spread from country to country by his agency then we may fairly assume that it has extended continuously from man to man.

It is hardly to be supposed than we can always trace the disease from A, B, and C, to D, E, and F ; but if we can so follow it from A to D, and the evidence is in favour of its extending in the same way from B to E, and from C to F, it requires no great stretch of the imagination to conclude that the disease did thus extend from man to man in the latter cases, because we are convinced it did so in the former. I have shown, for example, that out of nineteen men who drank water contaminated with cholera dejecta five were seized with cholera in less than three days. There was no chance of error in this case ; the organic matter contained in the drinking-water without doubt produced a disease in these people, the prominent feature of which was that the epithelium of their intestinal canals underwent a change precisely similar to that of the organic matter entering with the water, and this occurred in a community free from the disease, and living under good hygienic circumstances. Here, therefore, is the evidence of the direct communication of the disease from A to D, and from it are we not justified in concluding that, under similar circumstances, B and C communicated the disease to E and F, as, for example, at Hurdwar in 1867, and that they in their turn spread it over the country as described by Dr. Murray? By the evidence afforded by these cases let us thoughtfully examine the history of the disease in all times and places, and

we cannot but conclude that cholera is a communicable disease from man to man.

It is necessary, however, to be explicit as to the form of cholera which is thus communicable; it is Asiatic cholera we are discussing, and I have given the definition of the disease in the first chapter of this work. I need hardly say this differs essentially from sporadic cholera, which no one ever supposed to be communicable, either in this country or in any other parts of the world; and which evidently arises quite independently of any pre-existing disease, usually from over-indulgence in food, or from eating unripe fruits or suchlike unwholesome matters. I am quite prepared to admit that there is an analogy between the diseases; I believe they are both connected with changes in the intestinal canal; but in the sporadic form, there is no evidence to show that the fomes are capable of setting up a special and deadly molecular action in the intestines of otherwise healthy people, which is characteristic of Asiatic cholera, giving rise to the rice-water alkaline stools, and the rapid death which too frequently follows this form of disease. On the other hand it cannot be denied that cholera is not easily distinguishable from sporadic diarrhoea; and I should chiefly rely upon the fact of cholera being present, and choleric epidemic at the same time, in order to connect the two together, believing as I do that choleric is simply a modified form of Asiatic cholera, and is capable of engendering this more deadly form of the disease in other people by means of the dejecta.

The seventh characteristic of cholera which I would notice is, that the more explicit the examination, the clearer the fact appears; that the disease, in the majority of cases, spreads from one human being to another by means of the cholera fomes finding its way into drinking water, and thus into the intestines of other people.

If we examine all the reports with reference to the epidemic of 1865-66, we shall notice how directly they tend to support Dr. Snow's theory, and to refute the view expressed by the London College of Physicians in 1854, which was to the effect, that it was never likely that water would be found to be the medium of communication in cholera. In investigating this matter we must again return to the history of the disease, and I would especially point to the instance I have mentioned in connection with the epidemic of 1861 in the Punjab, as positive evidence of water, contaminated with

cholera evacuations, being a medium of the communication of cholera from one person to many others.

Dr. Snow's Broad Street case was a remarkable illustration of the influence of contaminated water in spreading the disease. Doubtless the choleraic dejecta of the first patient in this locality had passed into the well of the Broad Street pump, and, while undergoing oxidation, had affected many of those who partook of the water. No more definite evidence of this fact could possibly have been afforded, than when the Broad Street pump-water was accidentally carried out to Hampstead, and generated the disease in two of the three persons who there partook of it.

Dr. Richardson's investigations into the spread of the disease among the men of Her Majesty's Navy in the Crimea in 1854 is hardly less to the point; and Dr. W. Farr's account of the outbreak in Newcastle during the same year affords a very remarkable example of a similar kind, which, in conjunction with the explosion of cholera in the districts supplied by a certain portion of the East London Water Works in 1866, leaves us hardly any room to question the part played by water, contaminated by the excreta of cholera patients, in the production or rather in the extension of the disease. We may safely assume that cholera never would have been generated among those who suffered, had it not been for the circumstances described in the history of these cases.

Turning now to India, we have illustrations of the same facts in the instance of the outbreak of cholera at Hurdwar in 1867. First, we have evidence of the assembling of an enormous congregation of pilgrims, some of whom had come from districts and villages in which cholera was prevalent; but the disease did not spread among them until the downpour of rain occurred on the 11th of April, the night before the great bathing day. The assembled crowd (three millions in number), having been soaked to the skin for twelve hours, rushed down in a body to the river with their wet clothes on, and drank of its water, which must thus inevitably have been contaminated with any organic matter washed off their saturated cotton garments. Within twenty-four hours cholera burst out in all directions among those unfortunate people, and they afterwards disseminated it throughout the country.

Nor must we omit the consideration, that if the organic matter of cholera dejecta lives, grows, and is destroyed in water, it accounts

for much concerning the disease which has hitherto been a mystery. Take for instance the case of the ship "Britannia" in 1854. The mortality that took place on board the vessel, in which cholera broke out sixteen days after leaving Varna, was very great; and yet they supplied themselves from an infected ship with additional hands, and transferred some of their sick in return; but in neither case did the crew in or from the infected vessel suffer.

The "Britannia" had left an infected port. Supposing the water contained in her tanks to have been contaminated, it would have been poisonous to many of the men drinking it during a certain stage of decomposition, probably lasting from five to eight days. The organic matter having then passed through this condition, might have been, and probably was drunk with impunity by those subsequently coming on board. On the other hand, the disease did not extend to the crew of the second vessel, although cholera cases were put on board, because the drinking-water was preserved from contamination.

On the other hand, in the case of Calcutta, since the introduction of pure water into the town, we have seen how very materially cholera has decreased among the inhabitants of the place (p. 420, *et seq.*), demonstrating the fact, that in a locality having the unenviable reputation of being the "home of Asiatic cholera," a pure supply of water has greatly diminished the death-rate among its population; the mortality that still occurs from this disease among the people being attributable, in many instances, to persons who have contracted the disease beyond the precincts of the town, or who have not availed themselves of the protection afforded them by the municipal authorities—preferring river, well, or tank water, to that distributed by the Calcutta water works.

CHOLERA—MEMORANDUM OF PRIVY COUNCIL—PRECAUTIONS AGAINST THE INFECTION OF CHOLERA.

1. As Asiatic cholera is now prevailing in foreign ports within a week's voyage of this country, and may probably extend to others which have still quicker communication with England, it is not unlikely that, within the next month or two, occasional cases of the disease may be brought into the ports of this country.

2. A recent Order of Council, dated 29th July, has given power to the respective local authorities to deal with any such cases, if they arrive, in a way to protect the population, as far as practicable, against surprise. But as cases of choleraic infection have innumerable degrees of severity, it is possible that some such cases, slightly affected, will, notwithstanding the vigilance of local authorities, be landed without particular notice in English sea-board towns, whence then they may advance to other, and perhaps inland, places.

3. Former experience of cholera in England justifies a belief that the presence of imported cases of the disease at various spots in the country will not be capable of causing much injury to the population, if the places receiving the infection have had the advantage of proper sanitary administration; and in order that all local populations may make their self-defence as effective as they can, it will be well for them to have regard to the present state of knowledge concerning the mode in which epidemics of cholera (at least in this country) are produced.

4. Happily for mankind, cholera is so little contagious, in the sense in which small-pox and scarlatina are commonly called contagious, that, if reasonable care be taken where it is present, there is scarcely any risk that the disease will spread to persons who nurse and otherwise closely attend upon the sick. But cholera has a certain peculiar infectiveness of its own, which, *where local conditions assist*, can operate with terrible force, and at considerable distances from the sick. It is characteristic of cholera—not only of the disease in its developed and alarming form, but equally of the slightest diarrhoea which the epidemic influence can cause—that all matters which the patient discharges from his stomach and bowels are infective, and that, if they be left without disinfection after they are discharged, their infectiveness during some days gradually grows stronger and stronger. Probably, under ordinary circumstances, the patient has no power of infecting other persons except by means of these discharges; nor any power of infecting even by them, except in so far as particles of them are enabled to taint the food, water, or air which people consume. Thus, when a case of cholera is imported into any place, the disease is not likely to spread, except in proportion as it finds, locally open to it, certain facilities for spreading by *indirect infection*. In order rightly to appreciate what these facilities must be, the following considerations have to be borne in

mind :—*first*, that any choleraic discharge cast, without previous thorough disinfection, into any cesspool or drain, or other depository or conduit of filth, infects the excremental matters with which it there mingles, and probably to some extent the effluvia which those matters evolve ; *secondly*, that the infective power of choleraic discharges attaches to whatever bedding, clothing, towels, and like things have been imbued with them, and renders these things (if not thoroughly disinfected) as capable of spreading the disease in places to which they are sent (for washing or other purposes) as, in like circumstances, the cholera patient himself would be ; *thirdly*, that if by leakage or soakage from cesspools or drains, or through reckless casting out of slops and wash-water, any taint (however small) of the infective material gets access to wells or other sources of drinking-water, it imparts to enormous volumes of water the power of propagating the disease. When due regard is had to these possibilities of indirect infection, there will be no difficulty in understanding that even a single case of cholera, perhaps of the slightest degree, and perhaps quite unsuspected in its neighbourhood, may, *if local circumstances co-operate*, exert a terribly infective power on considerable masses of population.

5. It might be supposed that under those provisions of the Sanitary Act, 1866, which relate to precautions against dangerous infections of disease, security could be taken, as regards the infective discharges of cholera, against various kinds of personal conduct which would be dangerous to the public health ; above all that, under those provisions or otherwise, the universal disinfection of such discharges could be enforced. Undoubtedly everything possible in this direction ought to be done, wherever a case of cholera is known to exist ; too much importance cannot be attached to the precaution of thoroughly disinfecting, without delay, all discharges from the stomach and bowels of persons suffering under the disease, as well as all bedding, clothing, towels, and the like, which such discharges may have imbued ; and of course neither choleraic discharges nor any slops which may contain traces of them, should ever (even when supposed to be disinfected) be cast into any position from which they may get access into drinking-water. The duty of observing those precautions is one which ought never to be neglected ; but populations cannot prudently stake their lives on the chance that it will be completely fulfilled for them. Apart from all

question of negligence, the degrees of cholera are too many, and the slight and incipient cases far too apt to escape observation, for any such defence against its infection to be more than partial. *And the main object for endeavour must be to secure such local circumstances that cholera-contagium; though not disinfected, shall be unable to act extensively on the population.*

6. The dangers which have to be guarded against as favouring the spread of cholera-contagium are particularly two. First, and above all, there is the danger of *water supplies* which are in any (even the slightest) degree tainted by house refuse, or other like kinds of filth; as where there is outflow, leakage, or filtration, from sewers, house-drains, privies, cesspools, foul ditches, or the like, into streams, springs, wells, or reservoirs, from which the supply of water is drawn, or into the soil in which the wells are situated—a danger which may exist on a small scale (but perhaps often repeated in the same district) at the pump or dip-well of a private house; or, on a large and even vast scale, in the source of supply of public water-works. And, secondly, there is the danger of breathing *air* which is foul with effluvia from the same sorts of impurity. Information as to the high degree in which these two dangers affect the public health in ordinary times, and as to the special importance which attaches to them at times when a violent diarrhoeal infection is likely to be introduced, has now for so many years been before the public, that the improved systems of refuse removal and water supply, by which the dangers are permanently obviated for large populations, and also the minor structural improvements by which separate households are secured against the dangers, ought long ago to have come into universal use. So far, however, as this wisest course has not been adopted, temporary security must, as far as practicable, be sought in measures of a palliative kind. (a.) Immediate and searching examinations of sources of water supply should be made in all cases where the source is in any degree open to the suspicion of impurity, and the water, both from public and private sources, should be examined. Where pollution is discovered, everything practicable should be done to prevent the pollution from continuing, or, if this object cannot be attained, to prevent the water from being drunk. (b.) Simultaneously, there should be immediate thorough removal of every sort of house refuse, and other filth which has accumulated in neglected places; future accumulations of the

same sort should be prevented; attention should be given to all defects of house drains and sinks through which offensive smells are let into houses; thorough washing and lime-washing of uncleanly premises, especially of such as are densely occupied, should be practised again and again. (c.) Disinfection should be very freely and very frequently employed in and round about houses, wherever there are receptacles or conduits of filth, wherever there is filth, sodden porous earth, wherever anything else, in or under, or about the house, tends to make the atmosphere foul. In the absence of permanent safeguards, no approach to security can be got without incessant cleansings and disinfections, or without extreme and constant vigilance against every possible contamination of drinking water. [For detailed advice on disinfection, see the Office Memorandum on this subject.]

7. In view of any possibility that the infection of cholera may again be present in this country, it is desirable that in each locality the public should ascertain to whom it has practically to look, in case of need, for its collective safety against such dangers as the above. The responsibility is, in a large proportion of cases, mixed. The most critical of all its branches, the responsibility of providing for the unpollutedness of water-supplies, is, in many very important places, in the hands of commercial companies; and it is to be hoped that these companies, informed as they must be of the calamitous influence which some of their number have exerted in previous epidemics of cholera, will remember, if the disease should again be present here, that each of them in its daily distribution of water, has hundreds, or even thousands, of human lives in its hands. But, except to that extent, the responsibility for local defences against cholera, both as regards water supply and as regards local cleanliness and refuse removal, is vested in the local authorities—the “Sewer Authorities” and “Nuisance Authorities” of recent statutes. These authorities—the Town Councils, Improvement Commissioners, Local District Boards, Boards of Guardians, and select and common Vestries, of their respective areas of jurisdiction—are all, either electively or directly, so constituted as to represent the will of the local rate-paying population; and each such population has had almost absolute means of deciding for itself whether the district which it inhabits shall be wholesomely or unwholesomely kept. It is greatly to be wished that the former of these alternatives had, from long

ago, been the desire of every local constituency in the country. It may fairly be believed that, in considerable parts of the country, conditions favourable to the spread of cholera are far less abundant than at former times of visitation; but it is certain that in very many places the conditions of security are wholly or almost wholly absent; and it is to be hoped that, in all this large class of cases, the authorities, under present circumstances, will do everything which, in the remaining time, can be done, to justify the trust reposed in them by the Legislature for the protection of the public health.

8. It is important for the public very distinctly to remember that pains taken and costs incurred for the purposes to which this Memorandum refers, cannot in any event be regarded as wasted trouble and expense. The local conditions which would enable cholera, if imported, to spread its infection in this country, are conditions which day by day, in the absence of cholera, create and spread other diseases—diseases which, as being never absent from the country, are, in the long run, far more destructive than cholera; and the sanitary improvements which would justify a sense of security against any apprehended importation of cholera would, to their extent, though cholera should never reappear in England, give amply remunerative results in the prevention of those other diseases.

By direction of the Lords of the Council,
(Signed) JOHN SIMON.

*Medical Department of the Privy Council Office,
10th August 1871*

INDEX.

	PAGE		PAGE
ADEN, cholera in, 1858, . . .	241	BALY AND GULL on epi-	
" " 1863, . . .	287	demic of 1826, . . .	77
Afghanistan, cholera in,		Blanc, Dr. H., on cholera	
1839,	131	in Indian jails, . . .	381
Africa, cholera in, 1836, . . .	102	Ballot, Dr., on cholera in	
" " 1858, . . .	242	Holland,	322
" " 1865, 287, 340		Balkh, communication with	
Agra, " " 1843, . . .	136	India,	18
" " 1869, . . .	432	Bassorah, communication	
America, " " 1832, . . .	97	with India,	15
" " 1848, . . .	164	cholera in, 1821, . . .	62
" " 1853, . . .	197	Batavia, cholera in, 1638, . .	34
" " 1865, . . .	307	cholera endemic in, . .	410
" " 1866, . . .	331	Bartolette, Dr., on cholera	
report on the cholera of		of 1851,	189
1873,	361	Bengal, condition of, prior	
cholera carried into, by		to 1800,	22
coolie ships, . . .	303	revenue of, in 1786 and	
Andaman Islands, cholera		1872,	26
in,	377	cholera in, prior to 1817,	34
very like fever, . . .	29, 235	" from 1821, . .	66
Alexandria, cholera in,		" 1826-27, . . .	78
1823,	63	" 1863,	283
Arabia, cholera in, 1827, . .	84	village, description of, .	415
" " 1845-46, . . .	158	Bernice, traderoute through,	7
" " 1858, . . .	241	Bicks', Dr., viewson cholera,	
" " 1863, . . .	286	1832,	110
cholera imported into, by		Boats, country, cholera in,	133
troops from India, . .	61	passage up Ganges, . . .	443
Arkhangelsky, Dr., on		Bokhara, cholera in, 1844,	149
cholera of 1849-50, 174,	191	Bombay, " " 1818,	56
Asia, cholera in, 1873, . . .	339	" " 1834,	124
Astrakhan, " " 1823, . .	63	" " 1845,	158
Australia exempt from		" " 1849,	187
cholera,	405	" " 1851 to 1861,	244

	PAGE		PAGE
Board of Health report on		Cholera Gazette,	96
cholera of 1849,	213	simulates intermittent	
in India,	278	fever,	235
Broad Street case,	210	contaminated water cau-	
Budd, Dr. W., on cholera		ses disease,	268
of 1848, 178,	219	precautions against, . . .	461
Burmah, cholera in, 1783, .	41	China, cholera in, 1820, . .	71
" " 1819,	70	" " 1841,	142
" " 1842,	146	" " 1862,	271
Dashire, communication		" " not endemic in, . . .	410
with India,	16	Charlestown, cholera im-	
Cabul, cholera in, 1861, . .	265	ported into, 1832,	108
" " 1829,	83	Characteristic features of	
" " 1839,	131	cholera,	450
" " 1844, 148, 155		Clothes, soiled, cause of	
Calcutta, " 1782,	39	cholera, 109, 223	
" " 1817,	47	Communication of the disease, 202	
" " 1826,	78	" by clothes, 109, 223	
" " 1830,	115	" by prisoners, 234	
" " 1837,	125	Communication between	
" " 1840,	133	Bombay and Suez,	6, 11
" " 1848,	183	" Bassorah,	15
" " 1853,	226	" Bagdad,	16
" " 1863,	283	" China and Eu-	
" " 1866,	342	rope,	17
" " influenced by		Commission, Sanitary, of	
water,	422	India, 1863,	166
" " propagated by		" its work,	279
milk,	383	" European, 1854, . . .	217
" " death-rate		" " 1865,	289
from,	423	" " 1874,	368
Coolies and cholera, . . .	363	Constantinople, cholera in,	
Cape of Good Hope ex-		1847,	160
empt from cholera,	406	Conclusions regarding cho-	
Canary Islands, cholera in		lera of 1817-23,	76
1851,	175	" " 1832,	112
Cashmere, cholera in, 1867,		" " 1840,	138
339-352		" " 1848,	177
Caucasus, " 159		" " 1875,	278
Central Asia, " 1843, 147		College of Physicians on	
" Provinces, " 1818, 50		cholera of 1848,	181
" " 1834, 123-127		Cornish, Dr., on Madras	
Cholera, Asiatic, definition of, 1		cholera, 249, 251	
" " earliest descrip-		Contaminated milk cause of	
tion of,	32	cholera,	384
" " not known in Eu-		" food "	385
rope before 1830,	28	" water "	387
		Cylong, cholera in, 1819, .	71

	PAGE		PAGE
DACCA, cholera in, 1817, .	48	Filth does not cause cholera,	407, 452
Definition of Asiatic cholera, .	1	Food, contaminated, cause of cholera,	385
Dejecta, dried, a cause of cholera,	109	Fort William, cholera in, 1814,	43
Desert influence on cholera,	404	„ influence of water supply,	433
Disease first described by Portuguese,	31	Frank, Dr., on cholera in, Munich,	357
unknown in Europe before 1830,	28	Fresh arrivals subject to disease,	138
Drought stops spread of cholera,	119, 261	Fungus growth and cholera, .	179
Dublin, cholera introduced into,	321	Gaspar Corria on cholera of 1503,	32
EARLY history of the disease,	22	Geographical distribution of cholera,	398, 435
East London cholera of 1866,	313	“ Gertrude,” the history of,	269
Ely M'Clellan's account of cholera, 1832,	97	Goa, cholera in, 1563,	33
Epidemic cholera of 1781-83, .	38	Goddess of cholera, worship of,	34
1817-23,	46-76	Government of India and cholera,	278
1826-35,	77	Guadeloupe, cholera in, 1865,	308
(Indian), 1830 to 45,	115	HILL tribes, cholera among,	116, 400
1841-49,	141	History of cholera prior to 1817,	28
1848-53,	183, 225	Himalayas, cholera in, 82, 193, .	258
1855-56,	226	Hirsch, Professor, on cholera,	29, 355
1858-61,	258	Home of cholera,	408
1863-66,	283	Holland, spread of cholera in,	323
1866-71,	54	Hormos in M. Polo's time, .	14
Endemic area of cholera, .	408, 412	Howrah, cholera in,	433
England, cholera in, 1831, .	93	Huc, M., on cholera,	72
„ „ 1848-49, 162, .	170	Hunter, Dr. W. W., on Purí Pilgrims,	273
„ „ 1853,	197	Hurdwar, cholera of 1781, .	38
„ „ 1859,	203	„ „ 1867,	346
„ „ 1866,	313	INDIAN cholera of 1845, .	156
army affected by, 1854, .	207		
fleet „ „ „ .	205		
Euphrates, route by,	13		
Exports from India to Europe,	21		
Bombay to Persia,	22		
FARR, Dr. W., on cholera of 1848,	180		
Fever mistaken for cholera, .	235		

	PAGE		PAGE
Peshawur, cholera in, 1867,	352	Secunderabad, cholera at, .	387
Pettenkoffer's theory of cholera,	219	Ships, quarantine rules for,	373
on Madras cholera,	248	Simon, Mr. J.,	218
theory tested,	417	Singapore, cholera in, 1819,	70
Peninsular and Oriental Steam Company,	11	" " " " 1840,	141
Pilgrims, Persian,	190	Simla, " " " " 195,	397
" " " " Dr. Hunter on,	273	Snow, Dr., on cholera of 1848,	178, 210, 219
" " " " at Hurdwar,	347	Soiled linen and cholera,	109
Places exempt from cholera,	404	Southampton, cholera in,	1865, 306
Police, Indian, and statistics,	25	" " " " 1866,	314
Portuguese account of cholera,	31	Strachey, Sir J., on cholera,	266
Precautions against cholera,	461	Straits, cholera not endemic in,	141, 409
Prisoners, Indian, and cholera,	116	Steamers first in Red Sea,	11
" " " " Dr. Blane on,	389	" " " " Persian Gulf,	16, 22
Punjab cholera of 1844,	150	"Swanton," the cholera on,	166
" " " " 1852,	195	Symptoms of cholera,	2
" " " " 1855,	233	Sydenham on cholera,	30
" " " " 1861,	263		
QUARANTINE, failure of,	99, 106, 161	Tholozan, Dr., on cholera of 1849-51,	174
benefit of,	64, 313	" " " " 1837,	104
rules and regulations for,	371	Teheran, cholera of 1853,	196
Quebec, cholera introduced into, 1832,	98	Theories on cholera of 1840-50,	177
RADCLIFFE, Netten, on cholera of 1866,	316	"The Times," on sanitation in India,	279
Rajpootana cholera of 1866,	344	"Topaz," the, and Mauritius,	72
Rolleston, Dr., on Madras cholera,	248	Trade route through Arabian Gulf,	5
Russia, cholera in, 1830,	91	" " " " by Cape of Good Hope,	9, 21
" " " " 1848,	160	" " " " by overland,	11
" " " " 1853,	196	" " " " through Persia,	12
" " " " 1867,	338	" " " " from China,	17
Rules for quarantine,	371	" " " " Lassa,	18
for protection from cholera,	461	" " " " Balkh,	18
SANITARY commission for India,	266	" " " " Cabul,	19
" " " " "The Times" on,	276	" " " " bearing on cholera,	20
Sanitary science in India,	279	returns from India and Europe,	21
Sanskrit writers on disease,	28	Russia and Bokhara,	87
Season, dry, effect on cholera,	119	Troops disseminate cholera,	63

	PAGE		PAGE
Travels against wind, . .	57	Water supply, and cholera	
Trincomalie, cholera of		in Calcutta, .	421
1783,	40	,, , Fort William,	433
Tytler, Dr., on cholera of		,, , at Agra, . .	432
1817,	48	,, , at Howrah, .	433
United States report on		Wind and cholera, 57, 187,	445
cholera of 1866,	333	Wolff, Dr., and cholera, .	121
,, , 1873,	361	Worship of Goddess of	
,, , and Indian		cholera,	34
coolies, .	361	Workhouse, London Union,	
WATER companies and cho-		1866,	319
lera, 208, 214,	316	Yarkund, cholera of 1843,	147
,, Dr. Ballot on, . .	331	Yeman, . , 1820,	60
		,, , 1863,	287

GLASGOW:

Printed at the University Press.

BY MACLEHOSE AND MACDOUGALL, 153 WEST NILE STREET.

